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General Requirements

1.0 Introduction

The Visitor Information System (VIS) consists of a standard group of component parts that are mechanically assembled and include:

- Extruded aluminum panel rail (top and bottom) into which a sheet aluminum core is inserted for rigidity.
- Steel or wood uprights with finished top or companion cap. Upright material includes tubular weathering steel and tubular stainless steel, hot rolled flat bar stock and stainless steel flat bar stock, all with sandblasted finish; or Western Red Cedar timbers with bronze straps to which the rails are connected.
- Sign panels which are inserted into the rails in the front and back of the aluminum core. The sign panels accommodate a variety of graphic media including: porcelain enamel graphics on steel; computer cut adhesive vinyl graphics (retroreflective vinyl and/or non-reflective) on retroreflective background (with aluminum backing panel), digitally printed graphics on adhesive vinyl, digitally printed graphics integrated into high pressure laminate, and digitally printed graphics embedded in fiberglass.

Signs and sign assemblies are to be manufactured using materials and fabrication processes as described in these specifications and in companion drawings and should match the quality of initial submissions.

1.1 Dimensions

Metric dimensions are used for legend size and all related dimensions including layout grids, panel sizes, post lengths, mounting height, and post drilling for connection of panel to post. All hardware, machine parts (cast caps, mechanical fasteners, connection details), and materials (tube, dimensional lumber) are specified in inches.

1.2 NPS License for Use of Visitor Information System (VIS)

The design of the Visitor Information System (VIS) is patented and proprietary to, and is owned by, Meeker & Associates, Inc. The system is licensed to the National Park Service for use only in national parks and affiliated areas. Vendors manufacturing this product for the NPS are prohibited from using this system for any other purpose, product, or customer.

1.3 Material Options and Substitutions

All materials are to be new and of first quality. Materials shall meet or exceed the standards and specifications herein or by reference. All materials shall comply with this specification or be an “approved equal”.

A limited number of materials have been specified by manufacturer's trade name. These include: 3M™, and Avery Dennison adhesive graphic films and retroreflective sheeting materials, Penofin wood treatment, Matthews Acrylic Polyurethane paint systems, 3M ScotchPrint™ brand electrostatic printing on adhesive vinyl, Pannier digitally printed graphics embedded in fiberglass panels, and Hilti masonry anchor systems. These products are specified as examples and not to limit use of alternative products and suppliers that are of equal or superior quality.

1.4 Function

These specifications are provided as a guideline for the fabrication, assembly, and installation of signs for the UniGuide Program of the National Park Service. Material and fabrication specifications are provided for each structure and related graphic panels.

All signs are to be built to the specifications described in this chapter. Additional instructions and requirements are to be provided within contracts that describe the performance of specific sign fabricators and suppliers.

1.5 Sign Identification Codes

Visitor Information System

V.DE.TS	Direct embedment for assemblies with tubular posts
V.DE.BS	Direct embedment for assemblies with flat bar stock posts
V.CO.T/B	Direct embedment into concrete footing for shallow footing conditions
V.RO.RS	Direct embedment of round tubular post in core-drilled rock (F.1)
V.AB.BP	Baseplate mount with anchor bolts in concrete footing (tubular steel post)
V.AB.BP	Baseplate mount with a standard footing (wood post with steel baseplate)
V.TR.BP	Baseplate mount to threaded rod anchored into rock or concrete
V.TR.BP	Baseplate mount to threaded rod anchored into bedrock
V.RO.SF	Baseplate attachment to corresponding stem footing in core drilled bedrock
V.CO.SF	Baseplate attachment to corresponding stem footing in concrete footing
V.TB.BP	Baseplate attachment to wood deck
V.TB.TS	Bolt attachment to deck joist
V.LB.WM	Wall mount on wood or masonry surfaces (J.1)

1.6 Installation Sticker

All finished sign panels shall be provided with a 1-1/4" x 2-1/2" weather resistant identification placed on the back of the sign indicating sign plan ID number, manufacturer, date of fabrication, and installation date.

1.7 Reference Standards

- Specification for Architectural Porcelain Enamel on Steel for Exterior Use (PE1:S-100(86) as issued by the Porcelain Enamel Institute, Washington, D.C.

- American Society for Testing and Materials standard specification for Aluminum and Aluminum Alloy Sheet and Plate (ASTM- 6061-T5 extruded shapes with Type 2: Black anodized finish, and 3003-H16, 3003-H14, 2024-T3, 6061-T6, and 5052-H34 aluminum plate)
- American Society for Testing and Materials standard specification for Stainless Steel tube and structural shapes (ASTM- 316L and 18-8)
- American Society for Testing and Materials standards for Weathering Steel ASTM-588 (A-847 as a tube product)
- American Society for Testing and Materials, and American Institute for Hollow Structural Sections standards (HSS) for ASTM-500; Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- American Society for Testing and Materials standard specification D-523 for paint gloss and D-4587 for accelerated weathering cycles for paint
- American Society for Testing and Materials: Standards for threaded steel rod and “J” bolts
- Dimensional Lumber: Laminated clear heart, kiln-dried vertical grain redwood or Western Red Cedar with maximum moisture content of 12% for panels, fabricated posts, and monolith edge. Redwood to be selected per grading rules of the California Redwood Association or better for panels, frames, and posts. Cedar to be selected per grading rules of the Western Red Cedar Lumber Association
- California Redwood Association grading rules for Dimensional Redwood lumber including Clear Heart, kiln-dried vertical grain redwood, and Construction Heart redwood
- Western Red Cedar Lumber Association Number 1, Select, and No. 1 Structural Select Lumber using the grading rules of the National Lumber Grading Authority as approved by the American Lumber Standards Board of Review

1.8 Graphic Standards

All graphic formats, use of typography, color, directional arrow graphics, pictograms and NPS Arrowhead logo shall comply without deviation from the Graphic Standards illustrated in Chapter 2. All exceptions must be approved in writing by the NPS National UniGuide Program Manager based on a graphic submission submitted for review.

1.9 Dimensions

Metric dimensions are used for the size of panels and component parts with hard conversions in feet/inches noted in specifications. Legend size and all related dimensions including layout grids for Visitor Information System are in both points and picas for typographic reference and in centimeters and millimeters for alignment and panel layout.

1.10 Structural Engineering

All structures have been engineered to meet typical conditions for all national parks. Special conditions that are outside these parameters are to be engineered on a site specific basis.

1.11 Quality of Materials

All materials shall be new and of first quality. Materials shall meet or exceed the standards and specifications herein or by reference. Factory seconds shall not be accepted. All materials shall comply with this specification or approved equal.

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UniGuide Engineering

2.0 Engineering Criteria

The following criteria have been used as the standards governing material specifications, assemblies and footings for all recreation project signs unless otherwise specified.

Wind Pressure	20 PSF ***
Soil	1-TSF (2 KSF)-Minimum * **
Frost Depth	36" Maximum unless otherwise noted
Concrete:	3000 PSI. / 28 days

* For all direct embedment footings, backfill in 6" lifts tamped to 95% compaction.

** Subgrade materials are assumed to be organic free sand/gravel/silt, or mixture of same, with bearing capacity of 1-TSF (2 KSF) min, subject to inspection.

*** Exceptions include sign placements along the Gulf of Mexico and in the region of Cape Hattaras, with installations engineered site specific to the location.

If these criteria are not adequate for a specific sign location, modifications shall be made to conform to the basic assembly specifications of specified sign type. Modifications may include, but are not limited to, thicker panels, larger dimension sign posts or larger footing configuration.

The design of the structural requirements of special one-of-a-kind signs shall conform to the basic assembly specifications for similar sign types. The modified assembly shall fulfill the requirements of local criteria for wind pressure, soil, and frost depth.

3

Installation

3.0 Introduction

Installation may include assembly and installation only, or assembly, installation and removal and disposal of existing signs.

3.1 Workscope

Contractor shall furnish all labor, materials, tools, equipment, loading/unloading and transportation services required to perform and complete the work according to the specifications and contract documents. All work shall be done with no damage to mounting site or sign.

3.2 Staging Area

If requested, the NPS will provide a lay-down and staging location for sign assembly and sign component storage during the installation process. Location will be in close proximity to the construction site but outside of areas that are actively used by park visitors. Contractor shall stay within designated area and not damage surrounding vegetation. Upon completion of installation project, Contractor shall remove all materials and restore area to preexisting condition. Securing the area will be the responsibility of the Contractor.

3.3 Footings Reference

For complete specifications on foundations and assembly, refer to Chapters 4 and 5 of this volume.

3.4 Sign Location

All signs are to be mounted at locations as identified in the sign plan and approval by the COTR. Sign locations will be marked with a stake. The stake shall have the sign type code, and location code, and correspond to the sign location plan drawings.

- Double post signs will be staked at the location of the left leg when facing the sign. Double-faced signs and angled installations will be staked with both leg locations noted.
- Double-post assembly stations will be identified using two stakes for the two posts of the primary installation with orientation of the assembly to follow location drawing.
- Campsite identification assemblies will be placed in the same location as existing identifiers unless noted otherwise.

3.5 Field Verification

The Contractor shall check and verify all dimensions and conditions at the job site prior to installation. Discrepancies are to be brought to the attention of the COTR for adjudication and resolution.

3.6 Survey

No surveys are required. All survey and land data will be provided by the NPS and are not the responsibility of the contractor unless otherwise specified.

3.7 Sign Engineering

All sign engineering will be the responsibility of the contractor unless otherwise noted in contract documents.

3.8 Obstructions

Unforeseen obstructions may limit the depth of a standard footing or require special mitigation to prevent damage to existing tree roots. Where possible, move the sign as needed to allow unconstrained subsurface installation. If a sign placement location must be moved because of subsurface obstructions, the Contractor shall notify the COTR. If the sign can be logically moved, verify sight-lines of adjusted locations to affirm that sign is still visible from the designated approach.

- If plant and tree obstructions are identified, and the sign location cannot be moved, follow the instructions below for Tree/Plant Protection, and Mitigation of Damage.
- If the sign location cannot be moved and nonplant (rock) obstructions prohibit the footing from being as deep as specified, see respective “Shallow Footing” specification in Section 4 for adjusting footing configuration.

The COTR specified in the task order will provide known existing condition data on utility line locations in conjunction with park engineering and maintenance operations and utility company surveys. Prior to beginning excavation, the Contractor shall notify Contract Officer and utility companies of proposed sign locations and times for excavation.

The Contractor shall be responsible for locating and preventing damage to known utilities. If damage occurs, the Contractor shall repair the utility at no additional expense to the Government.

3.9 Site Protection

The Contractor shall provide all necessary protection for his work until turned over to the COTR. The Contractor shall protect all adjacent structures, surfaces, vegetation and plant materials from damage during installation. The Contractor will notify the COTR of any damage immediately of occurrence. Any damage to the items described above must be restored to original condition and appearance, or replaced within thirty days.

Confine all operations to work limits of the project. Prevent damage to natural surroundings. Restore damaged areas, repairing or replacing damaged trees and plants at no additional cost to the Government.

- Do not remove, injure, or destroy trees or other plants. Consult with COTR to remove agreed-on roots and branches, or whole branches or trees that interfere with sign installation.
- Do not fasten ropes, cables, or guys to existing trees.
- Carefully supervise excavating, grading, filling, and other construction operations near trees to prevent damage.

Minimize disturbance to tree trunks and root zones to prevent damage to trees.

- Do not drive over root zones unless work cannot otherwise reasonably be done. Driving over roots will compact the soil and can harm or destroy the tree.
- Do not pile excavated soil against tree trunks.
- Do not compact soil around roots to a greater degree than surrounding unexcavated soil except to meet compaction requirements for backfilling signpost installations.

3.10 Tree/Plant Protection

Do not remove, injure, or destroy trees, tree roots, or other plants without prior approval. Use accepted horticultural practices for all work. Adjust sign installation locations to keep them beyond the drip line wherever possible. Notify the COTR specified in the task order of any proposed sign locations within the drip line of the trees. The drip line shall be defined as the area below the farthest-spreading branches of a tree. Where such adjustments are not practical, maintain the following minimum clearances between the face of trees to be saved and the closest edge of sign footing:

- for trees more than 30' in diameter allow 10 feet
- for trees between 15' and 30' in diameter allow 8 feet
- for trees less than 15' in diameter allow 5 feet

3.11 Mitigation of Damage

Take steps to mitigate damage to roots wherever excavation must take place within the drip line of trees and wherever excavation must take place within the drip line of other trees 12 inches or larger in diameter:

- Excavate carefully where tree roots might be encountered. Where roots 2" and larger are encountered, hand excavate as required to prevent damage to roots. Tunnel under roots to be saved, hand excavating as necessary.
- Do not cut roots over 2" in diameter.
- Cleanly saw cut roots between 1" and 2 " in diameter where they interface with work; do not cut roots except as necessary. Roots between 1" and 2" in diameter which must be

cut shall be cleanly saw cut near the edge of sign foundation closest to the tree to prevent roots from being dislodged from soil by equipment.

- Within four hours of excavating wrap burlap around the ends of cut roots larger than 1' in diameter and wet the burlap. Keep the burlap moist until the sign is backfilled. During backfilling operations, bring the burlap to within a few inches of the ground surface.
- Thoroughly wet roots and burlap in the excavated area before backfilling. Backfill shall contain as much water as is compatible with compaction.

3.12 Archeological Findings

Petroglyphs, artifacts, burial grounds or remains, structural features, ceremonial, domestic, and archeological objects of any nature, historic or prehistoric, found within the construction area are the property of and will be removed only by the Government.

3.13 Demolition

Sign to be replaced shall be removed completely by the Contractor following or in conjunction with installation of the new signs unless otherwise specified.

All designated existing signage and related structures shall be removed from the project area and disposed of properly in accordance with state and local regulations unless otherwise indicated.

3.14 Installation Quality

The Contractor shall install all signs level and plumb at the specified heights and alignments with all specified footings, backfill, or attachment hardware.

The Contractor shall remove all packing, sign boxes, and construction materials from the project upon completion of installation.

The Contractor shall replace damaged ground cover with same species as damaged in the installation process unless instructed otherwise in the installation specifications provided by the park.

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Materials Overview

4.0 Introduction

This section covers material specifications for all components used in the UniGuide Visitor Information System.

4.1 Aluminum

4.1.1 Rails

- 1.25" Extruded aluminum (6063-T6 or 6063-T6/T651), single channel rail section, with Type 2: black anodized finish
- 1.25" Extruded aluminum (6063-T6 or 6063-T6/T651), double channel rail section, with Type 2: black anodized finish
- 1.25" extruded aluminum (6063-T6 or 6063-T6/T651), face mount double channel retainer section with, Type 2: black anodized finish
- 1.25" extruded aluminum (6063-T6 or 6063-T6/T651), double channel rail section with offset slot on one side for accessories, with Type 2: black anodized finish
- 1.25" extruded aluminum (6063-T6 or 6063-T6/T651), double channel section with removable face, with Type 2: black anodized finish
- 1.25" extruded aluminum (6063-T6 or 6063-T6/T651), single face section with extended support plate for reverse and forward angle display, with Type 2: black anodized finish

4.1.2 Core panels

- 0.125" sheet aluminum (2024-T3 or 7075-T3) for panel core for vertical panel display
- 0.25" sheet aluminum (2024-T3 or 7075-T3) for panel core of angled wayside exhibit structures and specific small panel system assemblies and accessories

4.1.3 Sign blanks

0.080" sheet aluminum (2024-T3 or 7075-T3) backing panel for adhesive graphics

4.1.4 Wall mount

1.75" x 1.75" x 0.25" extruded aluminum angle (6061-T6) for wall sign mount frame with Type 2: black anodized finish

4.1.5 Accessories

- 0.875" x 0.4375" bar stock aluminum (6061-T6), milled and tapped, with Type 2: black anodized finish for outside frame of bulletin cabinet
- 0.75" x 0.6875" bar stock aluminum (6061-T6), milled to receive cabinet face and corner clips, with Type 2: black anodized finish for bulletin cabinet door frame
- 0.060" (2024-T3 or 7075-T3) alloy sheet for trash bag dispenser cabinet and frame

4.1.6 Mounting templates

- 0.5" (x 5", 6" and 7") plate aluminum (2024-T3, 7075-T3) for machined drilling templates for mounting "J" bolts and wood sign baseplates
- 0.5" head press fit drill bushings for master templates for mounting bolts

4.2 Steel

4.2.1 Uprights and baseplates

- 2" x 2" x 1/8" and 3" x 2" x 1/8" wall tubular weathering steel (A-847) for sign uprights
- 2" x 6" x 1/8" wall tubular weathering steel (A-847) for fabricated angle uprights of cluster and tri-side assemblies
- 3/8" weathering steel plate (A-847) for welded baseplates for assemblies with tubular uprights and narrow profile bar stock uprights
- 1/2" weathering steel plate (A-847) sheared or waterjet plate cut to 2" widths for narrow profile bar stock uprights
- 2" x 2" x 1/8" and 3" x 2" x 1/8" wall tubular steel section (A500B) for sign uprights of galvanized and painted assemblies
- 2" x 6" x 1/8" wall tubular steel section (A500B) for fabricated angle uprights of galvanized and painted inline and tri-side assemblies
- 3/8" steel plate (A-36) for welded baseplates for assemblies with tubular steel uprights or with bar stock uprights (galvanized or painted)
- 1/2" x 2" flat bar stock steel (A-36) for narrow profile assemblies (galvanized or painted)
- 3/8" steel plate (A-36) for welded baseplates used with wood upright assemblies
- 1/4" x 2" steel plate (A-36) welded baseplate straps for wood upright assemblies

4.2.2 Stabilizers

- 6" x 6" x 11-gauge steel plate (A-36) for bottom of embedment hole to mitigate settling of tubular steel uprights (as required)
- 3" x 3" x 3/16" x 24" steel angle (A-36) to stabilize embedment of narrow profile signs with 0.5" x 2" steel (A-36) bar stock uprights
- 3-1/2" x 3-1/2" x 1/4" x 24" steel angle (A36) back plate to anchor through bolted baseplates of deck-mounted reverse angle assemblies
- 0.25" x 10" x 24" steel plate (A-36) to stabilize embedment of tubular steel uprights

4.2.3 Post caps (weathering steel)

- Weathering steel (A-847) machined post caps (2" x 2" and 3" x 2")
- Weathering steel (A-847) machined post caps with sandblasted finish for 2" x 6" fabricated weathering steel uprights for cluster and tri-side assemblies with 135 degree and 120 degree configurations

4.2.4 Post caps (galvanized/painted)

- Weathering steel (A-36) machined post caps (2" x 2" and 3" x 2")
- Weathering steel (A-36) machined post caps with sandblasted finish for 2" x 6" fabricated weathering steel uprights for cluster and tri-side assemblies with 135 degree and 120 degree configurations

4.2.5 Sign panels

16 gauge sheet vitreous or enameling steel, (ASTM A424) Type 1

4.2.6 Stem Footing

- 1.25" x 18" schedule 80 stainless steel (302, 304, 316) pipe for stem baseplate
- 3/8" x 5" x 5" stainless steel (ASTM-316L) for stem baseplate

4.2.7 Inline and cluster assemblies

10 gauge steel (A-36) for faceplate clips

4.3 Brass

- 0.25" x 2" brass flat stock (UNS No. C360) for inserted straps on wood assemblies
- 0.25" brass plate (UNS No. C360) for angled straps on wood assemblies
- 0.25" x 15 cm x 30 cm brass plate (UNS No. C360) for backing panel of single post, narrow profile assembly

4.4 Copper

- 20 ounce (c10200) sheet copper for fabricated cap on wood posts
- 1" – 2d copper nail (McMaster Carr 97952A100) for attaching copper cap to wood posts

4.5 Wood

- 13'-6" x 6" x 6" structural Select Grade Western Red Cedar for post for large double post assemblies, fingerboard assembly and street name sign
- 4" x 4" and 6" x 6" structural Select Grade Western Red Cedar for sign uprights

4.6 Hardware

4.6.1 Rail Attachment

- 1/4-20 x 1" stainless steel socket head cap screws (with stainless steel washer; see below) for rail attachment to upright (McMaster Carr 92196A542)

- Stainless steel spring lock washer for socket head cap screw (1/4" screw size), 0.26" ID, 0.363 OD, 0.078" min. thickness (McMaster Carr 98437A110)
- 1/4-20 x 1" stainless steel flat spanner head screw for rail attachment for upright in wall mount assemblies and for rail attachment for bar stock upright for narrow profile assemblies (McMaster Carr 94063A247)
- 8-32 x 3/8" slotted flathead stainless steel screws for rear attachment of retainer bar to vertical assemblies with 0.125" core panel (McMaster Carr 91781A192)
- 10-24 x 3/8" low head steel, socket head cap screws to attach core panel to wayside extrusion (McMaster Carr 92220A240)
- 10-24 x 3/8" stainless steel button head cap screw, style No. 3 hex with center pin (McMaster Carr 9563A240) for attaching removable rail face
- 0.3125" x 9.6875" stainless steel rod for street name sign and fingerboard tension bar
- 10-32 x 3/8" stainless steel socket head cap screws (McMaster Carr 92196A240) with stainless steel hi-collar helical spring lock washer to attach backing panel to narrow profile single post upright
- Stainless steel round base weld nut for 10-24 screw size, with 3/4" base dia., and 9/32" barrel height (McMaster Carr 90860A105) for attachment of backing panel to narrow profile single post upright
- Stainless steel, heavy duty spring lock washer, #10 screw size, 0.200" Id, 0.350" OD, 0.0586" min. thickness (McMaster Carr 91007A628) for attachment of backing panel to narrow profile single post upright
- 3/8-16 Stainless steel self-locking acorn nut (McMaster Carr 90507A250) to cover hex nut on wall mount reverse angle assemblies

4.6.2 Inline

- 10-24 x 1.5" button head, socket head stainless steel bolts to hold cover panel on fabricated upright for inline (McMaster Carr 92949A251) with No.12 stainless steel flat washer (McMaster Carr 92141A013)
- 10-24 x 3/4" coupling nut for attachment of fabricated leg cover to fabricated upright (McMaster Carr 90268A011)
- 3/16" dia. x 0.630" long, stainless steel (316) body and (18-8) stainless steel mandrel (McMaster Carr 97525A032) pop-rivet to attach clip angle to interior of tri-side, multiple post assembly

4.6.3 Wall mounted assemblies

- 1/4"-20 x 1" stainless steel round head screw (McMaster Carr 91783A533) with stainless steel flat washer (McMaster Carr 92141A029) and wall anchor for attaching assembly
- Stainless steel knurled press insert with (18-8) stainless steel 8-32 x 0.3125" cup point socket head set screw (McMaster Carr 92311A191) for narrow profile wall-mounted sign
- 1/4" zinc alloy lag bolt expansion shield for narrow profile wall mount (McMaster Carr 97040A029)

- 1/4"-20 x 1" stainless steel slotted flathead screw to attach backing panel of narrow profile wall mount (McMaster Carr 91858A542)

4.6.4 Stabilizer blade

- 3/8" x 3" zinc plated hex head machine bolt (McMaster Carr 91236A636), with galvanized washer and offset washers for mounting stabilizer blade
- 3/8" x 2" zinc plated hex head machine bolt (McMaster Carr 91236A632), with galvanized washer and offset washers for mounting steel angle stabilizer blade on narrow profile assembly
- 3/8" x 8" zinc plated hex head machine bolt (McMaster Carr 91236A652), with galvanized washer and offset washers for mounting steel angle stabilizer blade on double post low profile assembly and for through bolt assembly on stem footing
- 0.5" dia. x 0.035" x 15 cm long stainless steel tube (McMaster Carr 8989K78) to be used as a spanner between narrow profile leg assemblies

4.6.5 Anchor bolts and baseplate attachment

- 3/8"-16 x 14" stainless steel (18-8) "J" bolts (McMaster Carr-91615A140), with stainless steel hex nut (McMaster Carr-91849A031) for leveling and heavy duty stainless steel 1" dia. washer (McMaster Carr-98019A200) for mounting with concrete footing
- 3/8"-16 threaded stainless steel rod (18-8) (McMaster Carr-98920A031) cut for 3.5" positive embedment, or standard 3/8" x 5-1/8" HILTI-HVA rod with chisel point and embedment mark
- HILTI-HVA adhesive anchor system (or equal) for 3/8" x 3-1/2" embedment
- 3/8" flat washers (McMaster Carr 92141A031) and hex nuts (McMaster Carr 91845A031), thin nuts (McMaster Carr 91847A031), and stainless steel (304) finishing acorn nut (McMaster Carr-92994A031) for baseplate attachment
- 3/8"-16 x 2" stainless steel button head socket cap screw (McMaster Carr-92949A632) with companion washer (McMaster Carr-98019A200) for attachment of baseplate to mounting stem
- 3/8-16 stainless steel (18-8) heavy hex nut welded to bottom of stem footing baseplate for mounting bolt attachment (McMaster Carr-91849A031)

4.6.6 Bolts for mounting to deck

- 3/8" x 4" zinc plated hex head lag screw (McMaster Carr-91478A640) to attach baseplates to wood decks
- 3/8" x 3" zinc plated hex head machine bolt (McMaster Carr 91236A636), washers and hex nuts to through bolt baseplates to wood decks
- 3/8" x 4" zinc plated carriage bolt (McMaster Carr-93548A636), washers and hex nuts to through bolt supporting "L" brackets to wood decks
- 3/8" x 8" zinc plated carriage bolt (McMaster Carr-93545A652), washers and hex nuts to through bolt C.1 upright to face of deck joist

4.6.7 Bolts for wood sign mount

- No. 10 x 1.5" brass flat head Phillips wood screw (McMaster Carr-92114A251) to attach brass retainer straps to post
- 1/4-20 x 5.15" 18-8 stainless steel threaded rod (McMaster Carr-98804A029) with stainless steel acorn nut (McMaster Carr 92994A029) brazed on end for attachment of rail through 4" x 4" wood post
- 1/4-20 x 6.25" 18-8 stainless steel threaded rod (McMaster Carr-98804A029) with stainless steel acorn nut (McMaster Carr 92994A029) brazed on end for attachment of rail through 6" x 6" wood post
- 1/4-20 x 3.75" 18-8 stainless steel threaded rod (McMaster Carr-98804A029) with stainless steel acorn nut (McMaster Carr 92994A029) brazed on each end for attachment of retainer straps through 4" x 4" wood post
- 1/4-20 x 3-1/2" stainless steel socket head cap bolts (McMaster Carr 92196A558), with 1" x 0.067" stainless steel washer (McMaster Carr 98019A155) for rail attachment on street name sign and fingerboard assemblies
- 0.3125"Ø x 9.6875" stainless steel rod for street name sign assembly as stop
- 16 gauge stainless steel for custom fabricated retainer strap for street name sign assembly
- 3/8"-16 x 6.25" threaded stainless steel rod (18-8) (McMaster Carr-98920A031) with (316) stainless steel acorn nut (McMaster Carr-92994A031) and companion washer (McMaster Carr-98019A200) for attachment of wood post to upright baseplate straps

4.6.8 Bulletin cabinet

- 0.5" x 1.375" aluminum "L" shape frame assembly (2-screws, backing plate, tapped front plate) hardware (Nielsen 2400)
- (304) stainless steel continuous hinge with drilled holes. plain finish, 0.040 thick, 1-1/16" open wide (McMaster Carr 1658A417) for bulletin cabinet
- #4-40 x 3/16" long (18-8) stainless steel flat head Phillips machine screw, with undercut head (McMaster Carr 91771A111)
- 3/16" – (18-8) stainless steel flat, socket head machine screw, 8-32 thread (McMaster Carr 92210A192) *Accessories*
- 1-1/16" x 0.040" thick aluminum continuous hinge (McMaster Carr 1581A66) for trash bag dispenser
- 8-32 x 1/4" stainless steel low head socket cap screw (McMaster Carr 93615A317) for key-hole attachment of folder holders and campsite permit display
- 10-32 x 2" alloy steel, flat socket head screw (McMaster Carr 91253A018) with 1/2" plate washer and nut to secure for trash bag dispenser
- 0.1875" clear polycarbonate sheet material for bulletin cabinet face
- 0.1875" CRL vinyl glazing gasket for clear 3/16" polycarbonate sheet of bulletin display cabinet (0752C)
- Vinyl weather stripping for bulletin cabinet door (specification to be determined)

- 0.1875” and 0.1” acrylic sheet (clear and black) for brochure dispenser, campsite permit display, and camp registration display

4.6.9 Plastic/Nylon

- F & R Series, black cast polyethylene cap 0.625” dia. with 0.125” self capture shaft, Polymer Molding Inc.
- 0.5” black acrylic sheet for core panel of wall-mounted narrow profile signs
- 1.0” (OD) x 0.275” (ID) x 0.63” thick black nylon washer, Products Components Corp (M01176)

4.7 Graphics

- Porcelain enamel with high resolution graphics (up to 8 colors on 16 gauge steel, flat panel with sealed bead edge)
- 0.93” thick, high pressure laminate with high resolution printed graphics integrally impregnated in melamine with phenolic resin and kraft core (I-Zone brand or equal)
- 4 mil 3M Controltac™ electrostatic marking film (8640C) with 3M Scotchcal™ Protective Over-laminate (8945) applied to 0.080” aluminum backing panel
- 0.93” fiberglass sheet with digitally printed graphics embedded within top and bottom fiberglass layer
- 2 mil adhesive electro-cut vinyl sheeting for nonreflective cut graphics
- Type I-A medium-intensity retroreflective sheeting referred to as “engineering grade” with Class 1 adhesive backing that is pressure sensitive per ASTM 4956-01 and FHWA standard specification FP-96
- Type II-A medium high-intensity retroreflective sheeting referred to as “super engineering grade” with Class I adhesive backing that is pressure sensitive per ASTM D 4956-01 and FHWA standard specification FP-96
- Type III-A high-intensity retroreflective sheeting, with prismatic retroreflective material with Class 1 adhesive backing that is pressure sensitive, per ASTM 4956-01 and FHWA -FP-96
- Transparent overlay film should be warranted by the reflective sheeting manufacturer for the life of the retroreflective sheeting
- Translucent and opaque screen printing inks compatible with substrate

4.8 Paint

- Penofin Penetrating Oil Finish: Cedar color (Brazilian Rosewood oil, 99% UV) for all wood posts
- Matthews Pre-treatment: Acid Activated PT Filler (74760/74766) metal prep
- Matthews Rust Inhibiting White Epoxy Primer (274908) with Matthews Activator (274909) for painted weathering steel posts in wet, high saline, or very dry environments, and painting stainless steel baseplates

-
- Matthews Acrylic Polyurethane enamel (number 26A-1A) with appropriate activator and catalysts (see manufacturers specifications); alternate: Matthews low volatile organic compound formula available where environmental regulations require
 - Alkyd based, premium grade metal primer (Pittsburgh Paints, or equal) for protective coating on stabilizer blades

4.9 Adhesive

- Clear silicone adhesive for attachment of acrylic panel to aluminum panel of wall-mounted narrow profile signs
- 1/2" – 0.120" thick flexible magnetic stripping with adhesive backing (McMaster Carr 5759K23)
- Epoxy bond to attach round base weld nut to backing panel of single post narrow profile sign
- Two-part epoxy catalytic adhesive for attaching stem footing to bedrock

4.10 Masonry Materials

- Concrete for sign footings
- Gravel or crushed stone for placement at base of direct embedment
- Nonshrink exterior grade grout for backfilling stem footing and single post tube mounted in bedrock

5

Aluminum Component Fabrication

5.0 Introduction

This section covers aluminum fabrication for all components used in the UniGuide Visitor Information System.

5.1 Interior Aluminum Core Panel for Vertical and Angled Assemblies

5.1.1 Vertical Assemblies

Interior core panels should be made of 0.125" material: 2024-T3 or 7075-T3 alloy aluminum plate.

5.1.2 Reverse and Forward Angle Assemblies

Interior core panels should be made of 0.25" material: 2024-T3 or 7075-T3, alloy aluminum plate.

5.1.3 Accessory Assemblies

Integrated core panel and back panel for selected accessories should be made of 0.25" material: (2024-T3 or 7075-T3), alloy aluminum plate with top and bottom section milled to fit into core panel channel and sign panel channel of rail, with drilled and tapped holes to accept 8-32 screws at locations noted on drawing. Double milled section step to be smooth and milling dimensions to be consistent (+/-) 5/1000, along entire edge, with inside corner of steps to be a sharp 90 degree corner. Hole location to be within (+/-) 5/1000 of specified location in both directions. Assemblies include:

- Brochure Dispensers: 15 cm x 31 cm and 30 cm x 31 cm, with 4 holes
- Campsite Permit Display: 15 cm x 15 cm, with 2 holes
- Campground Registration Display: 60.1 cm x 31 cm, with 4 holes

5.1.4 Quality and Finish

Panels should be flat, clean, and free of any surface corrosion, oil, dirt, or other imperfections or contaminants. All edges are to be square and without edge burr or rounding from sheer cutting that will prevent snug insertion into retainer frame.

5.1.5 Tolerances

Overall size of core panels should be cut to (+/-) 10/1000 of specified size. Note: panels exceeding specified size will not fit into assembly.

5.1.6 Metal Fabrication—Vertical Assemblies

Drill and countersink holes in 60 cm (63.157 cm) high core panels to receive (8-32) flathead stainless steel screws for retainer rail, with screw being flush to back of panel. Do not over counterbore hole. Holes are placed 15 cm OC, with first hole being 7.5 cm from left edge. Panel size, number of holes, and hole location are shown in specification drawing.

5.1.7 Metal Fabrication—Reverse and Forward Angle Assemblies

Drill and counterbore holes (1.805” from top and bottom edges) along top and bottom of back panels. Flat bottom counter-bored holes to be 7.5 cm from side of the edge and 15 cm on-center to receive 10-24 x 3/8” low head steel socket head cap screws. Panel size, number of holes, and hole location are shown in specification drawing.

5.1.8 Core Panel Dimensions

Panel sizes include a 1 mm vertical adjustment gap for each vertical unit from top to bottom. Specified core panel width incorporates 1 mm gap between each 30 cm panel (example: core panel for 60 cm wide assembly is 60.1 cm). Vertical dimension of 60 cm core panels includes interior width of intermediate rail.

Standard core panel sizes accommodate all possible configurations using single panels or a combination of panels. Horizontally, the core is specified for the full width of the assembly. Vertically, assemblies may incorporate contiguous back panels or are made from individual panels (up to two units, or 60 cm in height), or a combination of single and double core panels to create the desired assembly configuration (up to 4 units high for 20 cm and 30 cm assembly modules). Assemblies that are taller than two 30 cm panels in height are assembled with intermediate double slot rail.

All reverse and forward angle assemblies are continuous panels and do not accommodate intermediate rails.

Vertical Sign Assemblies (0.125”)

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>90 cm wide</i>	<i>120 cm wide</i>
1 panel	30 cm x 31 cm	60.1 cm x 31 cm	90.2 cm x 31 cm	120.3 cm x 31 cm
1 panel (dbl-high 60 nom.)	30 cm x 63.157 cm	60.1 cm x 63.157 cm	90.2 cm x 63.157 cm	120.3 cm x 63.157 cm

45 cm Panels for A.1, A.5, and J.1

<i>Width x Height (cm)</i>	<i>45 cm wide</i>
1 panel (45 nominal)	45 cm x 46 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (20 nominal)	60.1 cm x 21 cm	80 cm x 21 cm

Flag-Mounted Sign Assemblies

Fingerboard Sign Assemblies (0.125”): 20 cm Panels: H.2

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (20 nominal)	80.1 cm x 21.1 cm

Reverse Angle Sign Assemblies (0.25")

30 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (30 nominal)	30 cm x 31 cm	60.1 cm x 31 cm	75.2 cm x 31 cm	90.2 cm x 31 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 31 cm	120.3 cm x 31 cm	150.4 cm x 31 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45 nominal)	45 cm x 46 cm	60.1 cm x 46 cm	75.2 cm x 46 cm	90.2 cm x 46 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 46 cm	120.3 cm x 46 cm	150.4 cm x 46 cm	

60 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nominal)	60.1 cm x 63.157 cm	75.2 cm x 63.157 cm	90.2 cm x 63.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 63.157	120.3 cm x 63.157 cm	150.4 cm x 63.157 cm

Narrow Profile Sign Assemblies (0.125")

15 cm Panels for Reverse Angle D.1, Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30 nominal)	15 cm x 31 cm	30 cm x 31 cm	45 cm x 31 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 31cm	75.2 cm x 31 cm	90.3 cm x 31 cm

15 cm Panels for Campsite Identification Number Sign: Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 15 cm

Accessory Panels (0.25") with machined dado along top and bottom of panel

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>60 cm wide</i>
Folder Holder	15 cm x 31 cm	30 cm x 31 cm	—
Campsite Permit Display	15 cm x 15 cm	—	—
Registration Display	—	30 cm x 31 cm	60.1 cm x 31 cm
Registration Cabinet	—	—	60.1 cm x 31 cm

Accessory Panels (0.125")

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>60 cm wide</i>
Bulletin Cabinet (60 x 60)	—	—	60.1 cm x 63.157 cm
Bulletin Cabinet (60 x 90)	—	—	60.1 cm x 95.314 cm
Trash bag Dispenser (30 x 60)	—	30 cm x 63.157 cm	—

5.1 Aluminum Rail and Retainer Extrusion

5.1.1 Dual Channel (R/1)

1.25" dia. round extruded aluminum shape with top and bottom channel for core panel and sign panel engagement. Rail to be a perfectly symmetrical section with straight and parallel sidewalls in slots.

5.1.2 Single Channel (R/2)

1.25" dia. round extruded aluminum shape with single channel for core panel and sign panel engagement. Rail to be a perfectly symmetrical section with straight and parallel sidewalls in slots.

5.1.3 Retainer Bar Extrusion (R/3)

1.25" extruded aluminum half round shape. Retainer bar to be a perfectly symmetrical section with straight and parallel sidewalls in slots and continuous grooves in back to receive a number 8-32 x 0.375" flathead screw.

5.1.4 Wayside Exhibit Extrusion (R/4)

1.25" asymmetrical single face extruded aluminum section with extended section on back of extrusion for 1/4" plate core panel and continuous grooves in back to receive a number 10-24 x 0.375" low head screw.

5.1.5 Removable Face Extrusion (R/5)

1.25" dia. round extruded aluminum shape assembly with top and bottom channel, with removable front face for panel removal. Both assembly pieces to be a perfectly symmetrical section with continuous grooves in primary section to receive a number 10-24 x 0.375" screw through drilled and milled hole in front extrusion.

5.1.6 Accessory Extrusion (R/6)

1.25" wide, semicircular extruded aluminum shape with centered channel in top half and offset channel in bottom for accessory attachment.

5.2 Fabrication**5.2.1 Extrusion Tolerance**

Extruded cross section to be within (+/-) 5/1000 of dimensions indicated on drawings.

5.2.2 Cutting Tolerance

Overall length of cut panel to be (+/-) 5/1000" of specified length.

5.2.3 Submissions

Contractor to submit samples of each extrusion with measurements of extrusion noted in red on a copy of the specification drawing prior to hardening die.

5.2.4 Rail Length

Extruded sections to be cut to the following lengths. Ends shall be milled smooth and be free of sawtooth or cutting burrs. See fabrication drawings.

5.2.5 Machining

Drill and tap both ends of rail section a minimum of 1.125" depth to accommodate a full 1" embedment of a 1/4-20 stainless steel socket head cap bolt. Holes and 1/4-20 tap to be precisely centered in end of extrusion. Location of holes and 1/4-20 tap in accessory extrusion and reverse angle extrusion to be as shown in drawings. Tapped thread in each end of extrusion to receive 60 degree countersink with 5/32" diameter maximum for positive engagement of cap bolt. Remove any metal chips created in tapping process.

5.2.6 Surface

Material surface to be smooth and free of scratches or other imperfections from extrusion or machining.

5.2.7 Finish

Extruded and machined shape to be anodized and finished with Type 2: black anodized finish.

5.2.8 Packaging for Shipping

Extruded shapes to be packaged to protect the finish of the pieces in transit.

5.2.9 Nonstandard Configurations Fingerboard Assembly

Single channel extrusion machined for fingerboard assembly to receive 235 degree mitered end with slot facing up for bottom rail and slot facing down for top rail. Measure overall length (83 cm) from outboard end after miter.

5.2.10 Hole for Tension Rod in Rail-Fingerboard and Street Name Assembly

Place 0.3125" dia. x 0.3125" deep hole in rail for tension rod. Orient hole for vertical placement of tension rod through assembly, with hole located precisely 19/32" from inboard end of rail.

5.3 Aluminum Angle Side Rails for Wall Mount Applications (J.1)

5.3.1 Material

6061-T6 Extruded Aluminum Angle, 1.75" x 1.75" x 0.25"

Wall Mount Sign Sizes: Angle lengths to be cut to the following sizes (two per assembly)

1 – 30 cm panel high	36 cm
1 – 45 cm panel high	51 cm
2 – 30 cm panels high	68.1 cm
3 – 30 cm panels high	100.3 cm
4 – 30 cm panels high	132.4 cm

5.3.2 Wall Mount Sign Fabrication

Machine 0.75” radius, top and bottom on out-side face of angle. Drill two (2) 0.3125” holes in back face for wall attachment. Drill and countersink 0.25” holes for 1/4–20 flathead spanner screws in outside face for rail attachment. Holes for rail attachment are to be 32.157 cm center-to-center as shown in the fabrication drawing.

Tolerances: Angle frame and placement of holes to be fabricated to within 5/1000” of specified size and location.

5.3.3 Surface

Material surface to be smooth and free of scratches or other imperfections from extrusion or machining and finishing.

5.3.4 Finish

Machined angle section to be anodized with Type 2: black anodized finish.

5.3.5 Assembly

Mechanically attach angle to rail section with stainless steel 1/4-20 x 1” flathead spanner screw.

5.3.6 Packaging for Shipping

Angle frames to be packaged to protect the finish of the pieces in transit.

5.4 Aluminum Panelsfor Adhesive Vinyl Graphics

5.4.1 Aluminum

Sign panels to be 0.080”, (2024-T3 or 7075-T3) sheet aluminum.

5.4.2 Panel Sizes

The sizes for aluminum panels are specified below. Variations from these sizes shall not be more than (+/-) 10/1000. Blank back panels may be NPS brown reflective sheeting on aluminum or a porcelain enamel panel that is NPS weathering steel brown or olive green. Back panels are the same size as the sign faces.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

Width x Height (cm)	30 cm wide	60 cm wide	90 cm wide	120 cm wide
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel (double-high 60 nominal)	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157

45 cm Panels for A.1, A.5, and J.1

Width x Height (cm)	45 cm wide
1 panel (45)	45 cm x 45 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (20)	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies

20 cm Panels for Fingerboard Signs: H.2

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (20)	80.1 cm x 20 cm

Reverse Angle Sign Assemblies

30 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (30)	30 cm x 30 cm	60.1 cm x 30 cm	75.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45)	45 cm x 45 cm	60.1 cm x 45 cm	70.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nominal)	60.1 cm x 62.157 cm	75.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 62.157cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies

15 cm Panels for Reverse Angle D.1, Vertical E.1

<i>Width x Height</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30)	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30cm	75.2 cm x 30 cm	90.3 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

5.4.3 Quality and Finish

Panels to be flat, clean, and free of any surface corrosion, oil, dirt, or other imperfections or contaminants that will inhibit adhesion of sign background material. All edges are to be square and without edge burrs or rounding from sheer cutting that will prevent snug insertion into rail frame.

6

Steel Component Fabrication

6.0 Introduction

This section covers steel fabrication for all components used in the UniGuide Visual Information System.

6.1 Tubular Steel Posts for Direct Embedment and Baseplate Mount (A.1-4, c.1-4)

6.1.1 Materials

Two types of steel tubing are specified. These include:

- Weathering steel
- Tubular

6.1.2 Weathering Steel (TS-W)

Tubular section weathering steel (A-847) with 1/8" wall, in section sizes: 2" x 2", and 3" x 2".

Note: at the election of the contractor, A-847 material can be galvanized in-lieu of A-500-B material.

6.1.3 Tubular Steel (TS-GS)

Tubular section steel (A-500-B) with 1/8" wall, in section sizes: 2" x 2", and 3" x 2" for galvanized structures.

6.1.4 Metal Finishing

All posts to be cut square. Finish to be free of edge burrs or sawtooth on cut edge. Fabricated posts to be degreased and sandblasted with copper slag abrasive to create an even finish throughout.

6.1.5 Galvanized (TS-GS)

Tubular steel to be hot dipped galvanized after fabrication.

6.1.6 Drilling Frame Assembly Holes for Rail Attachment

Drill 0.28125" holes through both sides of tube (2" face) at each attachment location noted on drawings. Expand 0.28125" holes on one side to 0.625" diameter for cap screw access and to accept outside hole plug. If uprights are fabricated forward angle or reverse angle format, expanded holes are to be placed on outside face with one left version and one right version. Post length to be as specified. Measure drill locations for attaching rails from the top of the tube, and drill all holes based on the dimensions from top. These holes begin 1.9 cm from the top of the tubular section; drilling tolerance between holes is (+/-) 5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

6.1.7 Weld Specifications for Joining Tubular Sections for Forward Angle, Reverse Angle and Sled Base Assemblies

Reverse and forward angle assemblies to be fabricated with full penetration weld using welding rod compatible with the (A-847 or A-500-B) alloy tube (depending on tube used for assembly). Finished weld to be ground smooth. All finished sections to have matching angle with no more than (+/-) 3 mm variation at top of panel when vertical sections are aligned.

6.2 Tubular Steel Posts for Direct Embedment Assemblies

6.2.1 Steel Stabilizer Plate

From the base of the post section, drill three 7/16" holes through both walls, front to back of the 3" face, for attachment of 1/4" x 24" x 10" steel plate to stabilize embedded post for 3/8" bolt. Stabilizer to be attached on 3" face with corresponding holes drilled in the stabilizer blade.

6.2.2 Paint Finish

The sandblasted and degreased surface to receive two coats of premium alkyd metal primer covering the bottom 95 cm of the post. Protect section of post above the 95 cm line to prevent paint splatter on the surfaces to remain uncoated.

6.2.3 Length of Tubular Steel Post for Direct Embedment

Length is determined by the number of panels, the standard height to the base, and standard 90 cm embedment. Width of post is determined by assembly width and mounting configuration. See fabrication drawings.

6.3 Baseplate Mounting

6.3.1 Tubular Steel Posts with Baseplates for Bolt Mounted Assemblies

Baseplate mounting designed for surface mounting baseplate on paved surfaces, on subsurface bedrock, or bolting to cast in place footing with "J" bolt or anchored threaded rod.

6.3.2 Material for Weathering Steel

Tubular section weathering steel (A-847) in section sizes: 2" x 2" x 1/8", and 3" x 2" x 1/8", with 5" x 5" x 3/8" A-847 weathering steel baseplate welded to bottom of tubular section.

6.3.3 Material for Galvanized or Painted Steel

Tubular section steel (A-500 B) in section sizes: 2" x 2" x 1/8", and 3" x 2" x 1/8", with 5" x 5" x 3/8" A-36 steel baseplate welded to bottom of tubular section. Note that A-847 material can also be used for galvanized and painted assemblies.

6.3.4 Baseplate Fabrication

Place (4) 7/16" dia. holes, one in each corner of plate, 0.75" from edges, 0.75" center drain hole as per fabrication drawing as noted in baseplate drawings. Note: Most applications use a 5" x 5" baseplate. Wall-mounted assemblies as well as in-line, cluster, and tri-side assemblies have unique baseplate dimensions.

Baseplate (5" x 5" x 3/8", or unique sizes for A.2-4, and C.2,) and base of tubular steel upright to be fabricated with full penetration weld on all four (4) sides using welding rod compatible with tube alloy. Sled base assembly to be fabricated with full tubular return. (see drawing 6.1-89) Welded location of upright to baseplate to be within (+/-) 10/1,000 of specified location on drawings. Welded uprights to be set exactly 90 degrees perpendicular to surface of the baseplate.

6.3.5 Mounting Configuration

The standard post length dimensions shown allow for the bottom of the baseplate to be placed at grade, or up to 5 cm (approximately 2") below grade. Once mounting height is determined, the top of the footing to be 2.5 cm below the bottom of the baseplate. For mounts below grade, this will allow for full coverage of bolt assembly when area restored to existing grade.

Fabricated Steel Posts for Inline, Cluster, and Tri-side Assemblies: Center sections of fabricated posts to allow access to interior section of post for attaching rails, with fabricated faceplate to cover interior section.

Inline Assemblies, A.2 Place 0.28125" holes through both sides of tube (2" face) at each rail attachment location noted on drawings. Measure drill locations for attaching rails from the top of the tube and drill all holes, center-to-center based on the dimensions from top for consistency. These holes begin 1.9 cm from the top of the tubular section; drilling tolerance between holes is (+/-) 5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

Mechanically cut full length center section, 2.125" wide from one side of post on 3" dimension, with outside dimension of section not to exceed 2.25" wide once post is adjusted for expansion. Removed section of tube to be used as fabricated post cover, or replaced with section of 0.125" plate of the same alloy. Cut tube to be straight and the outside (2" wide face) ends to be made parallel and aligned 90 degrees to the front and back of post. Following cutting, edges and face of tube to be smooth and free of burrs and cutting marks from top to bottom. Tack weld 10-24 x 0.75" coupling nut to inside of post. Place coupling nuts 18" on center over full length of post beginning with first attachment placed 3" from top of post. Drill corresponding 0.28125" holes through 2.125" wide faceplate for attachment of panel to post assembly.

To properly seat faceplate, fabricate brake formed 0.5" x 1.25" clip angle with corresponding 0.28125" holes in long leg to rail attachment points on post. Angle to extend the full length (less 1 cm top and bottom: 186 cm) of the post. Reveal between post and cover to be no less than 0.625" on each side with total gap to not exceed 0.1875" for finished assembly.

Fabricate and weld 5" x 5" x 0.375" baseplate to base of post (2" x 3" x 3/8") with full penetration weld on all four (4) sides using welding rod compatible with tube alloy.

Cluster Base Assemblies, A.3 Place 0.28125" holes through both sides of tube (2" face) at each rail attachment location noted on drawings. Measure drill locations for attaching rails from the top of the tube and drill all holes, center-to-center based on the dimensions from top for consistency. These holes begin 1.9 cm from the top of the tubular section; drilling tolerance between holes is (+/-) .5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

Mechanically cut full length center section 4.5" wide from one side of post on 6" dimension. Removed 4.5" section of tube to be used as fabricated post cover (or replaced with section of 0.125" plate of the same alloy). Brake form post to 135 degree angle on the center line of the 6" back face. Brake formed section to be straight and the outside (2" wide face) ends be made parallel and aligned 90 degrees to the front and back of post. Following cutting, edges and face of tube to be smooth and free of burrs and cutting marks from top to bottom. Tack weld 10-24 x 0.75" coupling nut to inside of post at locations 1.5" from 2" end on each side of brake formed section. Vertically align coupling nuts 18" on center over full length of post beginning with first attachment placed 3" from top of post.

Fabricate 2.5625" x 0.125" faceplate from section removed from 2" x 6" tube. Brake form the full length of the plate to match 135° degree angle of post section. Drill matching 0.28125" holes (each side) through brake formed faceplate for attachment of panel to post assembly.

To properly seat face plate, fabricate brake formed 1" x 1.25" clip angle with corresponding 0.28125" holes in long leg to rail attachment points on post. Clip angle to extend for the full length (less 1 cm top and bottom: 186 cm) of the post. Attach clip angle with rail attachment. Reveal between post and faceplate to be no less than 0.625" on each side and with total gap from both sides to not exceed 0.1875" for finished assembly.

Fabricate and weld 0.375" baseplate to base of post with full penetration weld on all four (4) sides using welding rod compatible with tube and baseplate alloy.

6.4 Tri-side Assemblies

6.4.1 Tri-side Assemblies, A.4

Place 0.28125" holes in back of tube (6" face) at each rail attachment location noted on drawings (10 holes). Holes are to be placed 1.5" from 2" end and placed on both sides of back face of tube. Measure drill locations for attaching rails from the top of the tube and drill all holes, center-to-center based on the dimensions from top for consistency. These holes begin 1.9 cm from the top of the tubular section; drilling tolerance between holes is (+/-) 5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

Place 0.1875" holes on sides of each 2" face for rivet attachment of interior clip angle. Holes to be placed 18" on center with first hole placed 3" from top of post. Mechanically cut full length center section 4.5" wide from one side of post on 6" dimension. Removed 4.5" section of tube to be used as fabricated post cover (or replaced with section of 0.125" plate of the same alloy). Brake form post to 120 degree angle on the center line of the 6" back face. Brake formed section to be straight and the outside (2" wide face) ends be made parallel and aligned 90 degrees to the front and back of post. Following cutting, edges and face of tube to be smooth and free of burrs and cutting marks from top to bottom. Tack weld 10-24 x 0.75" coupling nut to inside of post at locations 1.5" from 2" end on each side of brake formed section. Vertically align coupling nuts 18" on center over full length of post beginning with first attachment placed 3" from top of post.

Fabricate 2.140" x 0.125" faceplate from section removed from 2" x 6" tube and brake form the full length of the plate to match 120 degree angle of post section. Drill matching 0.185" holes (each side) through brake formed faceplate for attachment of panel to post assembly.

To properly seat face plate, fabricate brake formed 1" x 1.25" clip angle with corresponding 0.1875" holes in long leg to rivet clip angle to inside of post. Clip angle to extend for the full length (less 1 cm top and bottom: 186 cm) of the post. Reveal between post and faceplate to be no less than 0.625" on each side and with total gap from both sides not to exceed 0.1875" for finished assembly.

Fabricate and weld 0.375" baseplate to base of post with full penetration weld on all four (4) sides using welding rod compatible with tube and baseplate alloy.

6.4.2 Length of Tubular Steel Post with Baseplate for Bolt-Mounted Assemblies

Length is determined by the number of panels, the standard height to the base. Width of post is determined by assembly width and mounting configuration. See fabrication drawings.

6.5 Narrow Profile Assemblies

6.5.1 Fabricated Steel, Flat Bar Stock Uprights for Narrow Profile Assemblies (D.1, E.1)

One type of steel flat bar stock is specified for uncoated, painted or galvanized finishing.

6.5.2 Flat Bar Stock (FB-WS)

0.5" x 2" flat bar stock steel for upright reverse angle assemblies, (A-36) alloy.

An alternative to flat bar stock for reverse angle assemblies is the use 0.5" plate material, with reverse angle upright water-jet cut into single piece in lieu of miter and weld fabrication.

6.5.3 Machine Top of Post

Top of flat bar section to be machined with semicircular shape. Edge of semi-circle shaped machined top to have 0.625" radius on edge of machined work to smooth overall top of post. Edge shall be free of any sharp burrs.

6.5.4 Drill and Countersink holes for Bar Stock Post for Rail Attachment

Place 0.28125" holes through 2" face of bar stock at each specified rail attachment location noted on drawings. Countersink all holes placed for rail attachment to accept 1/4-20 x 1" flat-head spanner screws. Measure drill locations from the top of the bar stock post and drill all holes, measured from top down for consistency, with first hole placed 1.9 cm from the top of the flat bar section. Note: E.1 assembly may include an intermediate rail within 30 cm basis for placement of two (2) 15 cm x 14 cm panels. Drilling and hole location tolerance between holes are (+/-) 5/1000, with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

6.5.5 Drill Holes for Bar Stock Post for Stabilizer Blade

If the post is to be mounted by direct embedment, place three (3) 0.4375" holes at the specified location in lower section of leg for attachment of 3" x 3" angle stabilizer.

6.5.6 Welded Reverse Angle Post

Reverse angle assemblies to be fabricated bar stock mitered and welded with full penetration weld using welding rod compatible with the (A-36 or 316L) alloy tube as appropriate. Finished weld to be ground smooth. All finished sections to have matching angle with no more than (+/-) 3 mm variation at top of panel when vertical sections are aligned.

6.5.7 Welded Baseplate

Baseplate and bottom of post (5" x 5" x 3/8", or 5" x 9" x 3/8") to be fabricated with full penetration weld on all four (4) sides using welding rod compatible with alloy of flat bar and baseplate assembly. Welded location of upright to baseplate to be within (+/-) 10/1000 of

specified location on drawings. Welded uprights to be set exactly 90 degrees perpendicular to surface of the base-plate.

6.5.8 Length for Flat Bar Stock Posts Mounted by Direct Embedment

Length is determined by the number of panels, the standard height to the base, and standard 90 cm embedment.

6.5.9 Length of Flat Bar Stock Posts with Baseplate for Bolt-Mounted Assemblies

Length is determined by the number of panels and the standard height to the base.

6.5.10 Metal Finishing

All posts to be cut to precise length specified. Finish to be free of edge burrs or sawtooth on cut edge. Fabricated bar stock posts to be degreased and sandblasted using copper slag abrasive to create even finish over entire part.

6.5.11 Galvanized Finish

As required or specified, steel assemblies to be hot dipped galvanized after fabrication.

6.5.12 Paint Bottom for Embedment

The sandblasted and degreased surface to receive two coats of premium alkyd metal primer covering the bottom 95 cm of the post that will be embedded. Protect section of uncoated surfaces above the 95 cm line to prevent paint splatter.

6.6 Machined Post Cap (MC)

6.6.1 Machined Cap Fabrication

Cap for tubular steel posts to be machined from solid metal block. Caps for weathering steel posts to be machined from steel, (A-847) steel. Caps for steel assemblies to be galvanized or painted shall be machined from (A-36) alloy material.

Cap to be machined to match fabrication drawings. Finished caps to have a very snug interior fit into the specified post when inserted with a hard rubber mallet. Radius of machined cap to be flush to edge of corner radius based on average of the radius of the four corners. Mill 1.5 mm deep slot with 1 cm fronting edge of cap for tool access to allow removal if necessary.

6.6.2 Finishing

All exterior surfaces to be machined to 200 micro inches with exterior edge flush to side walls of tubular uprights. Following fabrication, lightly sandblast to match post surface into which it is being placed.

6.6.3 Assembly

Machined caps are to be inserted into posts prior to shipment.

6.7 Polyethylene, Self Capture Hole Plug**6.7.1 Polyethylene Plug Fabrication**

Cast black polyethylene self capture hole plug (Polymer Molding Inc., approval alternative). Cast cap to be inserted flush to face of steel tube with 0.625" diameter self-capture shaft, with satin finish from mold.

6.7.2 Finishing

Exterior molding seams to be free of flash at parting line.

6.8 Stem for Base Plate Mount without "J"-Bolt Footing**6.8.1 Material**

- 1.25" x 18", schedule 80 316L stainless steel pipe for stem baseplate
- 3/8" x 5" x 5" stainless steel (ASTM-316L) for stem baseplate
- 3/8"-16 x 2" stainless steel threaded rod (18-8) with 316 stainless steel acorn nut and companion washer for attachment of baseplate to mounting stem
- 3/8"-16 stainless steel (18-8) heavy hex nut welded to bottom of stem footing baseplate for mounting bolt attachment
- 3/8"-16 x 8" zinc plated hex head machine bolt with galvanized washer and offset washers for through bolt assembly on stem footing for anchorage in concrete

6.8.2 Fabrication

Drill 0.4375" hole through stem at location noted on drawing. Machine 5" x 5" x 0.375" stainless steel baseplate with radius corners. Place four (4) 0.5" dia. holes as specified in drawing. Weld 18" stem with full penetration weld (all around) in center of baseplate.

Stem to be perpendicular to baseplate. Tack weld 0.375" nuts over drill holes on same side as stem mount. Nuts to be welded flush to baseplate surface.

6.8.3 Finish

Remove all sharp edges and burrs from cutting and drilling of parts.

6.9 Stabilizer Blades for Tubular Steel Sign Posts

6.9.1 Steel Sign Posts Mounted by Direct Embedment (A.1, B.1, C.1)

A flat steel panel is mounted to embedded section of tubular steel uprights to restrict removal and reduce lateral movement or loosening of sign in its mount.

6.9.2 Material

0.25" x 10" x 24" steel plate (A-36) to stabilize embedment of tubular steel uprights.

6.9.3 Fabrication

Place three (3) 0.4375" vertically centered holes in plate at locations specified in drawing.

6.9.4 Finish

Remove all sharp edges and burrs from cutting and drilling of parts. Clean metal and paint with two heavy coats of alkyd based metal primer.

6.9.5 Assembly

Attach one stabilizer blade to each post of two post assemblies, or one blade to the narrow profile sign using a single post.

6.10 Stabilizer Blades for Flat Bar Stock Steel Sign Posts

6.10.1 Steel Sign Posts Mounted by Direct Embedment (D.1, E.1)

A steel angle section is mounted to flat bar stock uprights to restrict removal and to reduce lateral movement or loosening of sign in its mount.

6.10.2 Material

3" x 3" x 3/16" x 24" steel angle (A-36) to stabilize embedment of narrow profile signs with 0.5" x 2" bar stock uprights.

6.10.3 Fabrication

Place three (3) 0.4375" vertically centered holes in one of the angle faces at locations specified in drawing.

6.10.4 Finish

Remove all sharp edges and burrs from cutting and drilling of parts. Clean metal and paint with two heavy coats of alkyd based metal primer.

6.10.5 Assembly

Attach one stabilizer blade to each post of narrow profile two post assemblies that are 15 cm wide, or two (2) to each post in opposite facing direction of any assembly wider than 15 cm.

6.11 Metal Preparation and Paint Coating for Nonstandard Environmental Conditions

6.11.1 Painting

Steel posts are to be primed and painted when sign posts are specified for environmental conditions not recommended for unprotected weathering steel. These include very dry climates that will not provide sufficient moisture to allow the steel to develop a fully oxidized surface, heavily salinated coastal environments, or locations that are always wet and do not allow the steel to dry.

6.11.2 Reference

Matthews Paint Co. (1800-323-6593) 8201 100th Street, Pleasant Prairie, WI 53158

VOC Alternate: Matthews MAP-VOC (low volatile organic compound acrylic polyurethane) is available for use where VOC compliance is required.

6.11.3 Metal Preparation

Metal to be fully sandblasted with copper slag abrasive to remove all mill slag, surface rust, and dirt. All surfaces to be coated should be free of oil, grease, soil, weld slag, weld splatter, or other contaminants. Surfaces to be dry before application of primer. Tack wipe or remove sandblast residue or dust prior to applying pretreatment and priming.

6.11.4 Metal Pretreatment

Apply Matthews Acid Activated PT Filler (74760/74766) to provide superior bonding of primer and finish coat to clean bare metal. Mix with specified activator and per manufacturer's specification to 0.5 to 0.75 mils dry film thickness. Primer can be applied after 30 minutes, or when tack free.

6.11.5 Primer

Matthews Rust Inhibiting White Epoxy Primer (274908) with Matthews Activator (274909) and Reducer (285900) to be mixed with specified hardener and applied per manufacturer's specification to 1.5 to 3 mils dry film thickness (3 to 6 mils wet film thickness).

6.11.6 Finish Coat

Spray two (2) coats Matthews Acrylic Polyurethane (MAP) enamel, satin gloss finish (No. 26A-1A) mixed with MAP Catalyst and appropriate reducers depending on temperature and humidity per Matthews specification. Finish coat to be 1.5 to 2 mils dry film thickness (3 to 4 mils wet film thickness). Finish coat can be applied over Rust Inhibiting White Epoxy Primer within 30-60 min., or when dry to the touch. If finish coat is applied over 48 hrs. after primer application, surface to be lightly broken with 400 grit sandpaper.

6.11.7 Field Touch-up

Matthews Acrylic Polyurethane can be brush or roller applied. For good workability and finished surface quality use Matthews Brushing/Rolling Additive (no. 47-444SP). Color tolerance for match shall be 1 unit or less CMC.

6.11.8 Packaging for shipping

Painted posts must be fully protected prior to shipping to eliminate scratches or other surface abrasion in transit.

6.12 Steel Panels for Enameling**6.12.1 Sign Panels Enameling Steel**

For purposes of this specification, 16 gauge sheet steel is special purpose “vitreous or enameling iron or steel” as defined by ASTM A424 Type 1, tensioned leveled and especially manufactured for the purpose of porcelain enameling with total additions of copper and aluminum no greater than 0.002%.

6.12.2 Metal Cutting

Porcelain panels are to be cut to within 1 mm of specified size. Panels to be flat, clean, and free of any surface corrosion, oil, dirt, or other imperfections or contaminants. All edges are to be square and without edge burrs or deflection from cutting.

6.12.3 Flatness

Panels of one meter or greater shall be flat within 5 mm over all directions across the convex surface. Panels shall be flat within 1 mm over the concave surface in all directions. Panels shall not be more than 1 mm out of square when measured over the diagonal in total surface area of over 1 square meter and within 1 mm of the diagonal in panel under 1 meter surface area. Deviations shall be measured with the aid of an accurate steel tape and straight edge.

6.12.4 Printing side

Print porcelain enamel images on the concave side of the rolled steel sheet to help insure the proper fit after the panel is inserted into a finished assembly.

6.12.5 Graphic Panel Dimensions

Panel sizes include a 1 mm vertical adjustment top to bottom. Graphic panel width accommodates 1 mm gap between each 30 cm panel (example: core panel for 60 cm wide assembly is 60.1 cm). Vertical dimension of 60 cm graphic panels includes interior width of intermediate rail (example: a nominal 60 cm panel is 62.157 cm).

6.12.6 Panel Size Tolerance

Steel panels shall be cut to the sizes listed below. Size variation from these sizes should not vary more than (+/-) 10/1000.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>90 cm wide</i>	<i>120 cm wide</i>
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel (double-high 60 nom.)	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157 cm

45 cm Panels for A.1, A.5, and J.1

<i>Width x Height (cm)</i>	<i>45 cm wide</i>
1 panel (45)	45 cm x 45 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (20)	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies

20 cm Panels for Fingerboard Signs: H.2

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (20)	80.1 cm x 20 cm

Reverse Angle Sign Assemblies

30 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (30)	30 cm x 30 cm	60.1 cm x 30 cm	76.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	106.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45)	45 cm x 45 cm	60.1 cm x 45 cm	76.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	106.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nominal)	60.1 cm x 62.157 cm	76.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	106.3 cm x 62.157 cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies

15 cm Panels for Reverse Angle D.1, Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30)	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30 cm	76.2 cm x 30 cm	90.3 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

7

Wood Component Fabrication

7.0 Introduction

This section covers all wood component fabrication used in the UniGuide Visitor Information System.

7.1 Double and Single Post Signs with Wood Posts (A.5, B.2, C.5, H.1, H.2)

Fabricated solid (one piece) post using No. 1 Select Structural Grade Western Red Cedar. Material shall be well seasoned, free of any surface defects. Wood must be dry, with maximum moisture content not to exceed 12% during fabrication of assembly to maintain tolerances between component parts.

7.2 Upright Lumber Dimensions

Finished dimension is 3.5" x 3.5" from nominal 4" x 4" material and 5.5" x 5.5" for 6" x 6" material.

7.3 Milling Post Crown

Top of cedar post and ends of reverse angle and forward angle assemblies to be milled with an arc shape.

7.4 Length of Post

Cedar post and extension pieces for reverse and forward angle assemblies to be precisely cut to length specified. Sections of the attached forward angle and reverse angle parts to be mitered and sized precisely as specified.

7.5 Drilling, Double Post Assembly and for All Baseplates

Place holes through post for rail attachment as specified on drawings. Measure drill locations for attaching rails from the top of the post (crown of radius) and drill all holes based on the dimensions from top. Drilling tolerance between holes is (+/-) 5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole. All holes drilled through the timber sections to have common location on both sides of finished post and to be straight and true. Interior wood sign frame to be shop drilled for:

- 0.3125" dia. holes in side of post for through bolt attachment of rail, and bottom connection point on upright of forward angle
- 0.09375"x 1.5" pilot holes in post to receive wood screws to secure retainer straps to post

- 0.4375" dia. holes (2-front-to-back, and 2-side-to-side) for through bolt connection to baseplate tang at bottom of post. Note that lower hole on front face is 2" on-center from the bottom of the upright, and the lower side hole is 4.5" from the bottom of the upright with second hole placed 5" on center above the first hole

7.6 Drilling, Fingerboard Signs (H.2)

Although each assembly will accommodate up to eight (8) sign panels, with two on each side, attachment holes are to be placed in holes on a site specific basis for the configuration of each individual assembly. Mounting holes are to be vertically staggered from adjacent sides and placed laterally off-center to allow attachment of panels on opposing sides. Place 0.3125" dia. holes in side of post for through bolt attachment of rail. Maintain stagger of holes from adjacent directions as specified with top hole placed on side of milled crown. Counterbore 1.25" diameter hole with flat bottom drill that is 2.75" deep for inserting end of single channel rail.

7.7 Machine Dado for Rail Attachment Straps

Machine 0.25" x 2.0625" wide dado for inset of 2" retainer strap on inside and outside of posts (small hole side only for street name signs and fingerboard signs). Top of dado to incorporate 4" radius of retainer strap. Bottom of dado to be flat with straight sidewalls and 90 degree corners at bottom of dado. Abutting connection point of dado for forward angle or reverse angle to align precisely for uniform attachment of retainer strap. Location and dimensions of dado to match fabrication drawings precisely.

7.8 Machine Dado for Baseplate Mounting Straps

Machine 0.25" x 2.0625" wide dado at bottom of post on sides, front, and back face. Top of dado to extend 2" beyond top 12" of baseplate strap and feather out to front face of post to create smooth inset sleeve for inserting shims should they be required due to future post shrinkage.

7.9 Machine Dado for Tension Bar for Fingerboard

Place 0.3125" wide by 0.3125" deep dado between counterbored holes for tension rod used to secure rail attachment bolt.

7.10 Post length

The length of the post is based on the height of the panel assembly inserted into the assembly. Based on these format dimensions, there is a standard mounting height and post length for each assembly configuration. Post lengths are specified in the fabrication drawings.

7.11 Oil Finish Post

Apply two generous coats of Penofin Penetrating Oil Finish: Cedar color. Wood must be clean and dry. Apply second coat after first coat has been absorbed; approximately 3 hours but no more than 6 hours. Remove excess material with a rag 2 hours after applying second coat. Do not allow first coat to dry because it will limit the penetration of the second coat and leave gloss patches on the surface of the post.

8

Brass Component Fabrication

8.0 Introduction

Section 8 covers brass component fabrication for use with the Uniguide Visitor Information System.

8.1 Brass Straps

8.1.1 Brass Retainer Straps

Straps provide a positive connection of rails to wood uprights regardless of expansion or contraction of timber post.

8.1.2 Material

- 0.25" x 2" brass flat stock (UNS No. C360) for straight straps
- 0.25" brass plate (UNS No. C360) for angled straps

Fabricated Brass Retainer Straps (four per assembly)

<i>Size</i>	<i>Code</i>
14.638" X 2	1/30-RS
21.815" X 2	1/45-RS
27.320" X 2	2/30-RS
39.130" X 2	2/45-RS
39.914" X 2	3/30-RS
52.552" X 2	4/30-RS
10.779" X 2	1/20-RS
19.558" X 2	2/20-RS
28.337" X 2	3/20-RS
37.116" X 2	4/20-RS
27.276"/14.638" X 2"	60/30-RS *
20.565"/14.638" X 2"	45/30-RS *
14.638"/14.638" X 2"	30/30-RS *

* For both forward angle and reverse angle applications

8.1.3 Fabrication—Straight Strap

Cut brass straps to precise length as specified with machined top with 4" radius. Place 0.3125" dia. holes for attachment of rails at location and interval noted. Place 0.09" dia. holes and countersink for No. 10 flathead wood screw in strap for attaching to wood upright. Drilling tolerance between holes is (+/-) 5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

8.1.4 Fabrication–Angled Strap

Water-jet cut angled brass straps from 0.25” flat plate material to shape and length specified, including ends with 4” radius. Place 0.3125” dia. holes for attachment of rails at location and interval noted. Place 0.09” dia. holes and countersink from both sides of strap for No. 10 flathead wood screw in strap for attaching to wood upright. Drilling tolerance between holes is (+/-) 5/1000 with overall tolerance of 10/1000 measured from center of the top hole to the center of the bottom hole.

8.1.5 Finishing

Remove any sharp edges from cutting and milling strap. Sand brass with fine (220 or finer) emery cloth with orbital, nondirectional finish. Do not apply any protective coating. Straps are to be allowed to oxidize. Attach after Penofin Penetrating Oil Finish has dried to minimize oil staining the exposed brass material.

8.2 Brass Back Panel for Single Post Narrow Profile Assembly

8.2.1 Material

15 cm x 30 cm x 0.25” thick brass plate (UNS No. C360) for backing panel of single post, narrow profile assembly

8.2.2 Fabrication–Straight Strap

Cut brass panel to precise dimensions as specified. Place two (2) 0.3125” diameter holes with 0.875” counter bore (0.078” deep) to receive stainless steel round base weld nut for attachment of panel to post with 10-24 x 0.375” stainless steel cap bolt.

8.2.3 Finishing

Remove any sharp edges from cutting and milling panel. Sand brass with fine (220 or finer) emery cloth with orbital, nondirectional finish. Allow panels to oxidize. Do not apply any protective coating.

9

Stainless Steel Component Fabrication

9.0 Introduction

This section covers stainless steel fabrications for components used in the UniGuide Visitor Information System.

9.1 Stainless Steel Base Plates with Painted Finish

One size baseplate for each of the nominal posts sizes is specified, including the 5" x 5" for nominal 4" x 4" cedar upright and 7" x 7" for nominal 6" x 6" cedar upright.

9.2 Material

- 0.375" stainless steel plate (316L) for welded baseplates.
- 0.25" x 2" stainless steel flat stock (316L) for welded straps for baseplates

9.3 Side Straps

Cut 0.25" x 2" stainless steel flat stock to 12" length. Place two (2) 0.375" dia. holes in each piece at locations noted on drawing. Note that lower hole on front face is 2.25" on-center from the bottom of the upright, and the lower side hole is 4.75" from the bottom of the upright with second hole placed 5" on-center above the first hole.

9.4 Baseplate

Machine baseplates (5" x 5" and 7" x 7") with 0.625" radius corner and four (4) 0.5" dia. holes at locations specified on each respective drawing.

9.5 Welding

Weld side straps to baseplate with full penetration weld on both sides. Straps to be attached precisely as noted in drawing (+/- 10/1000). Finished straps to be aligned 90 degrees to the baseplate surface.

9.6 Finishing

Remove all sharp edges and burrs. Remove weld slag and machine oil. Sandblast baseplate assembly with copper slag abrasive to create even finish over all surfaces.

9.7 Metal Preparation and Paint Coating for Stainless Steel Baseplates

Stainless steel baseplates are to be primed and painted.

9.8 Reference

Matthews Paint Company (1800-323-6593) 8201 100th Street, Pleasant Prairie, WI 53158

9.9 VOC Alternate

Matthews MAP-VOC (low volatile organic compound acrylic polyurethane) is available for use where VOC compliance is required.

9.10 Metal Preparation

Metal to be fully sandblasted with copper slag abrasive to remove all mill slag, surface rust, and dirt. All surfaces to be coated should be free of oil, grease, soil, weld slag, weld splatter, or other contaminants. Surfaces to be dry before application of primer. Tack wipe or remove sandblast residue or dust prior to applying pretreatment and priming.

9.11 Metal Pretreatment

Apply Matthews Acid Activated PT Filler (74760/74766) to provide superior bonding of primer and finish coat to clean bare metal. Mix with specified activator and apply per manufacturer's specifications to 0.5 to 0.75 mils dry film thickness. Primer can be applied after 30 minutes, or when tack free.

9.12 Primer

Matthews Rust Inhibiting White Epoxy Primer (274908) with Matthews Activator (274909) and Reducer (285900) to be mixed with specified hardener and applied per manufacturer's specifications to 1.5 to 3 mils dry film thickness (3 to 6 mils wet film thickness).

9.13 Finish Coat

Spray apply two coats Matthews Acrylic Polyurethane (MAP) enamel, satin gloss finish (number 26A-1A) mixed with MAP Catalyst and appropriate reducers depending on temperature and humidity per manufacturer's specifications. Finish coat to be 1.5 to 2 mils dry film thickness (3 to 4 mils wet film thickness). Finish coat can be applied over Rust Inhibiting White Epoxy Primer within 30 to 60 minutes, or when dry to the touch. If finish coat is applied over 48 hours after primer application, surface should be lightly broken with 400 grit sandpaper for proper adhesion.

9.14 Field Touch-up

Matthews Acrylic Polyurethane can be brush or roller applied. For good workability and finished surface quality use Matthews Brushing/Rolling Additive (number 47-444SP). Color tolerance for match shall be 1 unit or less CMC.

9.15 Packaging for Shipping

Painted baseplates must be fully protected prior to shipping to eliminate scratches or other surface abrasion in transit.

10

Copper Component Fabrication

10.0 Introduction

This section covers copper component fabrication for use with the UniGuide VIS Signs.

10.1 Copper Cap for Wood Posts

- 20 ounce sheet copper for fabricated cap on wood posts
- 1" – 2d Copper nail (McMaster Carr 97952A100) for attaching copper cap to wood posts

10.2 Fabrication

Cut copper 3.250" x 6.572" and 5.250" x 10.326" caps for 4" x 4" (3.5" x 3.5") and 6" x 6" (5.5" x 5.5") cedar uprights respectively. Include 3.625" radius and 2.25" radius for each respectively as specified. Machine drill seven (7) 0.9375" dia. holes evenly spaced on top and bottom edge for attaching with nails.

10.3 Finish

Remove all sharp edges from fabrication. Mark the fold locations with metal scribe on each part.

11

Bulletin Case

11.0 Introduction

This section covers bulletin case assembly for use with the UniGuide VIS Signs.

11.1 Materials

- 0.125" sheet aluminum (2024-T3, 7075-T3) for panel core
- 0.1875" clear poly carbonate sheet material for bulletin cabinet face
- 0.1875" CRL vinyl glazing gasket for clear 3/16" poly carbonate sheet of bulletin display cabinet (0752C)
- Vinyl weather stripping for bulletin cabinet door of (specification to be determined)
- 1/2"–0.120" thick flexible magnetic strip with adhesive back (McMaster Carr 5759K23)
- Porcelain back panel in standard sign panel size for nominal dimensions of bulletin case assembly. Color: Weathering Steel Brown
- Interior backing panel: 0.0625" flat steel sheet with black baked enamel finish on front and back. Panel to fit flush inside outer frame of case assembly. Attach to aluminum core panel with 2 mil 3M-VHB tape
- 0.875" x 0.4375" bar stock aluminum (6061-T6), milled and tapped, with Type 2: black anodized finish for outside frame
- 0.75" x 0.6875" bar stock aluminum (6061-T6), milled to receive cabinet face and corner clips, with Type 2: black anodized finish for door frame
- 0.5" x 1.375" aluminum "L" shape frame assembly (2-screws, backing plate, tapped front plate) hardware (Nielsen 2400)
- 304 stainless steel continuous hinge with drilled holes, plain finish, 0.040 thick, 1-1/16" open wide (McMaster Carr 1658A417) for bulletin cabinet
- 4-40 x 3/16" (18-8) stainless steel flathead Phillips machine screw with undercut head (McMaster Carr 91771A111)
- 8-32 x 3/16" (18-8) stainless steel flat, socket head machine screw (MC# 92210A192)

11.2 Fabrication

Place countersunk holes in core panel to receive 8-32 x 3/8" flat head screws for attachment of bulletin cabinet frame from back of core panel. Size and miter and mill 0.875" x 0.4375" outside frame with holes in back to receive 8-32 flathead screws to attach frame to core panel, and vinyl weather stripping gasket material. Drill and tap for 4-40 x 3/16" screw on side wall of frame for attachment of continuous hinge. Machine 0.75" x 0.6875" aluminum bar stock to receive 3/16" clear poly carbonate sheet (with gasket) and corner clips. Drill and tap for 4-40 x 3/16" screw on side wall of frame for attachment of continuous hinge.

11.3 Assembly

Attach outside frame to core panel with gasket and hinge attached. Assemble door frame with clear sheet window and attach adhesive magnetic strip to back of frame. Insert enameled steel panel to back of the cabinet interior, placing the panel flush to the outside frame on each edge. Bond enameled steel panel to core panel.

11.4 Finish

All edges and machined surfaces to be smooth and free of sharp edges. All sizing of component parts to be (+/-) 5/1000".

All aluminum components to be anodized with Type 2, black finish.

12

Campsite Permit Display

12.0 Introduction

This section covers campsite permit display assembly for use with the UniGuide VIS Signs.

12.1 Campsite Permit Display (Weather Resistant)

12.1.1 Materials

- 0.25" sheet aluminum (2024-T3, 7075-T3) with milled stair-step for insertion into rail
- 0.1875" clear acrylic sheet
- 0.1" black acrylic sheet
- 8-32 x 1/4" stainless steel low head socket cap screw (McMaster Carr 93615A317) for keyhole attachment of folder holders and campsite permit display

12.1.2 Fabrication

Mill double 0.197" stair step in core panel for insertion into rail. Drill and tap two (2) holes in core panel to receive No. 8-32 screws for panel attachment. Laser cut four (4) layers to sizes as noted in specification drawings with three (3) back layers being black and with clear front layer. All finished sizing of component parts shall be within (+/-) 5/1000" of specifications.

12.1.3 Assembly

Glue assemble with acrylic cement and machine edges to be flush. Satin finish.

12.2 Campsite Permit Display (Exposed)

12.2.1 Materials

- 15 cm x 14 cm x 16 gauge porcelain enamel back panel with two (2) 5/64" holes for attachment of stainless steel clip
- 15 cm x 15 cm x 0.125" aluminum core panel with two 5/32" holes with countersink on back face for attachment of flat head screws
- Custom brake-formed 3" x 1.5", 18-8 stainless steel (18 gauge (0.0478")) clip with two 5/64" holes for attachment bolts
- 0.438" x 2.75" commercial grade neoprene rubber sheet, 1/32" thick (Durometer 50 Shore A -30 degrees + 200 degrees F)
- 6-32, 18-8 stainless steel acorn nut (MC91855A271) or (MC90507A210)
- 6-32 thread x 3/8" 18-8 stainless steel flat head undercut head phillips machine screw (MC91099A215)

12.2.2 Fabrication

Brake-form clip as shown. Fabricator will test clip to assure adequate pressure to retain permit without requiring undue effort to open clip to insert permit.

12.2.3 Assembly

Assemble clip as shown in assembly drawing. Place lock-tite adhesive on screw before attaching acorn nut to provide permanent connection.

Assemble with blank or lettered back 15 cm x 14 cm panel.

12.2.4 Finish

Stainless steel clip to receive random orbital finish. Porcelain enamel back panel to be standard Terra Cotta color.

13

Trash Bag Dispenser

13.0 Introduction

This section covers trash bag dispenser assembly for use with the UniGuide Visitor Information System.

13.1 Materials

- 0.125" sheet aluminum (2024-T3, 7075-T3) for panel core
- 1-1/16" x 0.040" thick aluminum continuous hinge (McMaster Carr 1581A66) for trash bag dispenser
- 10-32 x 2" alloy steel, flat socket head screw (McMaster Carr 91253A018) with 1/2" plate washer and nut to secure for trash bag dispenser
- 0.060", (2024-T3 or 7075-T3) alloy sheet for trash bag dispenser cabinet and frame

13.2 Fabrication

Place counter sunk holes in core panel to receive 10-32 x 2" flathead screws for attachment of trash bag handles. Cut sections of 0.60" aluminum sheet and fabricate with roll formed top, clip return, and side walls, and separate hinge strap. Adhesive weld top section of side walls where they join rolled front face. Spot weld hinge strap to core panel. pot weld hinge to hinge strap and to front panel of cabinet.

Assembly: Attach 10-32 x 2" flathead screws through back of core panel with with companion lock washer and hex nut. Attach to rail using removable face rail at top of assembly.

13.3 Finish

Finished assembly to be sanded and be free of sharp edges or surface imperfections. Entire assembly to be painted (Matthews Acrylic Polyurethane, Color: 39B-4D). See application specification in section 6.11 for procedure. Surfaces will not be sandblasted.

14

Registration Display

14.0 Introduction

This section covers registration display assembly for use with the UniGuide Visitor Information System.

14.1 Materials

- 0.25" sheet aluminum (2024-T3, 7075-T3) with milled stair-step for insertion into rail
- 0.1875" clear acrylic sheet
- 0.1" black acrylic sheet
- 8-32 x 1/4 stainless steel low head socket cap screw (McMaster Carr 93615A317) for key-hole attachment of folder holders and campsite permit display

14.2 Fabrication

Mill double 0.197" stair step in core panel for insertion into rail. Drill and tap two (2) holes in core panel to receive 8-32 screws for panel attachment. Laser cut four (4) layers to sizes as noted in specification drawings with three (3) back layers being black and with clear front layer. All finished sizing of component parts to be (+/-) 5/1000".

14.3 Assembly

Glue assemble with acrylic cement and machine edges to be flush. Satin finish.

15

Folder Display

15.0 Introduction

This section covers folder display assembly for use with the UniGuide Visitor Information System.

15.1 Materials:

- 0.25" sheet aluminum (2024-T3, 7075-T3) with milled stair-step for insertion into rail
- 0.1875" clear acrylic sheet for front face
- 0.1875" black acrylic sheet for break formed back section
- 0.125" black acrylic sheet for side walls
- 8-32 x 1/4 stainless steel low head socket cap screw (McMaster Carr 93615A317) for key-hole attachment of folder holders and campsite permit display

15.2 Fabrication

Mill double 0.197" stair step in core panel for insertion into rail. Drill and tap four (4) holes in core panel to receive No. 8-32 screws for panel attachment. Laser cut back panel, side panels and front panel to sizes as noted in specification drawings. Mill keyhole in black back panel to receive low head cap bolt attached to core panel. Brake form back panel with 113° and 90° degree angles. Brake form front clear sheet and bond to back panel. Bond sides to complete assembly. Nominal 30 cm wide assemblies to receive additional side panel in center to separate sides. All finished sizing of component parts to be (+/-) 5/1000".

15.3 Assembly

Glue assemble with acrylic cement and machine edges to be flush. Satin finish.

16

Campground-Trailhead Reservation Cabinet

16.0 Introduction

This section covers reservation cabinet assembly for use with the UniGuide Visitor Information System.

16.1 Materials

- 0.25" sheet aluminum (2024-T3, 7075-T3) for panel core with Type 2: black anodized finish both sides
- 0.50" wide x 1/32" thick polyurethane foam tape-adhesive on both sides (McMaster Carr 75845A669)
- 304 stainless steel continuous hinge with drilled holes. plain finish, 0.040" thick, 1-1/16" open wide (McMaster Carr 1582A132) for bulletin cabinet
- 4-40 x 1/4" (18-8) stainless steel flat head phillips machine screw, with undercut head (McMaster Carr 91771A106)
- 8-32 x 3/16" (18-8) stainless steel flat, socket head machine screw (McMaster Carr 92210A192)
- 0.080" thick aluminum plate
- Matthews acrylic polyurethane, with corresponding pre-treatment and primer
- 3" wide x 1-5/16" high x 5/16" thick extruded aluminum with clear anodized finish round handle pull (mcmaster carr 1568a11)
- 8-32 x 1/2" stainless steel screw and 0.50" dia. x 0.0625 thick plate washer

16.2 Fabrication

Drill and tap four (4) holes in core panel to receive 8-32 x 3/8" flat head screws for attachment of reservation cabinet assembly to core panel. Drill holes for 4-40 x 1/4" screws on top return of base pan frame for attachment of continuous hinge. Drill holes for 4-40 x 1/4" screws on front face of cover pan for attachment of continuous hinge. Apply 0.50" wide x 1/32" thick, double-sided adhesive, polyurethane foam tape to steel hinge then apply hinge to base pan and insert all screws and nuts. Use same technique for corresponding top cover pan.

Brake form sides and top with corners welded and ground smooth. Drill two (2) holes tin top panel for attachment of handle. Bottom of pan to receive double return. Drill and countersink four (4) holes in back panel to receive 8-32 x 3/8" flathead screws for attachment of back panel to core panel. Alignment must be $\pm 5/1000$ ". Assemble handle with 8-32 x 1/2" screws into drill holes in top pan.

16.3 Finish

Paint aluminum components with acrylic polyurethane. Follow instructions for panel prep and finish painting in Section 5.5.

16.4 Assembly

Attach assembly to core panel with four screws. Insert core panel and cabinet assembly into upper and lower retainer extrusions and connect posts with 1/4-20 x 3/4" socket head cap screws.

17

Graphic Layout and Production Overview

17.0 Introduction

The following sections are reflective of the five possible types of graphic production:

- Porcelain enamel on steel (Section 5.18)
- Computer cut, retroreflective and nonreflective graphics on aluminum (Section 5.19)
- Electrostatically printed digital graphics printed on adhesive vinyl (Section 5.20)
- High resolution ink jet printed digital graphics printed on adhesive vinyl (Section 5.21)
- Digitally printed graphics encapsulated in high pressure laminate (Section 5.22)
- Digitally printed graphics embedded in fiberglass (Section 5.23)

17.1 Artwork & Imaging

All images for panels shown in this specification will be prepared in specified digital processes with all layouts in conformance with respective grid formats.

17.2 Art Preparation

All artwork for panels will be prepared in electronic format using industry standard programs including Adobe Illustrator™, Macromedia Freehand™, Corel Draw™ for diagrams and files containing vector art used to cut adhesive materials for application to sign panels, and Adobe Photoshop™ for illustration and scanned photographic files. The version of the program shall be the latest version or the version which has been just preceded unless specified.

Artwork submitted to contractor shall be in a commonly available file format and stored on a commonly available removable media, such as Zip™, Jaz™, Syquest™, CD ROM, MO Drive™, or 3.5" floppy disk.

Art for porcelain enamel shall be produced with film positives and negatives as required from the electronic art files as supplied for fine line screen-printed sign production. Electrostatic production and ink-jet printing for embedment fiberglass will produce panels as direct output in their respective process. Computer cut vinyl and retroreflective graphics will be prepared as vector art for direct transfer to production equipment.

17.3 Submittals

A scaled output copy of the panels to be produced will accompany each order.

17.4 Art Approvals

To insure that the files are correctly output, the contractor will provide a paper copy of all panels to be reproduced. This copy shall be submitted to the COTR for approval before it is produced in the specified medium. Options for proof include: same size diazo print from

reproduction films, die-sublimation prints, laser print (full size or scaled 66% or 50%), or color ink-jet prints of final prepared from same file used to produce film work, or fine line plots of vector art files. All submissions must include crop marks and be at a definable scale (25%, 50%, 75%, etc.) and provide an accurate reflection of the panel to be produced.

17.5 Grid Format

All graphics to be formatted using the grid formats for the respective sign type specified. This includes type size, kerning, margins (left and right), top alignment, and overall panel proportions.

17.6 Typography and Symbols

All sign legends are to be prepared using the typographic specifications provided in this document. Typography to be Frutiger, NPS Rawlinson, and NPS Roadway. Symbols to be the SEG D National Recreation Symbols.

17.7 Artwork Storage

All panel artwork files (digital) shall be coded by number. Contractor shall retain all films (negative or positive) for each project for preparation of replacements or additional panels using the same graphics. Original artwork shall not be harmed in any way (writing, cutting, etc.). Files will remain property of the NPS and be returned at their request at the end of a contract period.

17.8 Color Matching

Supplier shall be able to match nearly the entire range of colors as represented by the Pantone Matching System (PMS) and Toyo Inks, etc.

18

Porcelain Enamel Signs

18.0 Introduction

Porcelain enamel on steel is a substantially vitreous, or glassy, inorganic coating bonded to metal by fusion at temperatures above 1400 degrees Fahrenheit. Porcelain enamel is not to be confused with baked paints or organic enamels.

18.1 Metal Prep & Production

18.1.1 Degreasing

All panels shall be degreased by immersion in an approved degreasing fluid. The panels shall then be rinsed in a heated water bath.

18.1.2 Etching

After the first rinse, panels shall be immersed in a caustic solution sufficient to provide an “etched” surface capable of good porcelain adherence. The panels shall then be rinsed.

18.1.3 Neutralizing

After the third rinse, the chemical action shall be neutralized in a soda ash solution and then dried rapidly.

18.1.4 Porcelain Enameling

A porcelain enamel ground coat shall be applied to all areas of each unit, including backside and flanges, by spraying methods approved by the Porcelain Enamel Institute. At least one additional separately fired cover-coating shall be applied to the face side and flanges of each unit. For corrosion protection and flatness, one additional coating shall be applied to the backside of each panel.

18.2 Finish

18.2.1 Continuity of Coating

Visual inspection of each unit shall reveal no visible breaks, gas bubbles, scumming, hair-lines, stress lines or surface defects in the cover coat.

18.2.2 Printing Side

Print porcelain enamel images on the concave side of the rolled steel sheets to help insure the proper fit after the panel is inserted into a finished assembly.

18.2.3 Finish and Background Color Control

The color and finish shall match a color sample previously submitted by supplier and approved by COTR within 1 NBS unit (1-2 NBS unit variation is barely perceptible to the human eye).

18.2.4 Ground and Covercoat Thickness

Ground and covercoat thickness shall be applied in accordance with PEI recommendations to a thickness range of 0.004" to 0.020" as required by the manufacturer to suit the intended use. Edges of steel panel to be fully sealed, with no steel visible through porcelain coating.

18.2.5 Firing

Panels shall be fired in a furnace custom designed for the purpose, at temperatures above 1400 degrees Fahrenheit. After firing, every panel must be visually inspected for color consistency against the control panel as approved by the Contract Officer.

18.3 Imaging

Line art/script shall be screened one color at a time with intermediate firing of each color before subsequent color is screened. The quality of the screen image shall be of high resolution with no ragged edges. Line art shall be screened over background colors, so that characters are not obscured by the application of color. Line art resolution shall be accurately printed at a standard which accepts as a minimum 1/2 point line thickness and type in sizes as small as 4 (lpi) lines per inch. Black and white & color photographic/lithographic imaging shall be available at a resolution of up to 200 (lpi) lines per inch.

Multiple color work shall maintain (+/-) 1/500 registration of all layers, one to another. Color layers shall be fully opaque, with no bleed-through, or change in hue, value or intensity as a result of the layering of color in the imaging process. Color to match the specified color as converted from PMS reference to porcelain enamel and approved by the client as a match sample prior to imaging the job. Colors shall match CMYK with color shift base on inherent qualities of base frits.

18.4 Screen Glazes

Glazes used in the screening process shall be acid resistant and opaque. The glazes shall be corrosion proof, UV proof, wind proof, and vandal resistant. All screen glass must be milled to a 400 mesh particle size or smaller.

Use only specially formulated porcelain enamel frits, glazes, and oxides as supplied by Ferro, Chivit, APEC or Cerdek. These materials when combined and processed in final form shall be acid resistant to achieve an A or AA acid resistance rating.

18.5 Technical Proficiency

Supplier shall be proficient in the reproduction of photographs by halftone and continuous tone methods, including process color and duotones.

18.6 Color Matching

Supplier shall be able to match all colors specified.

18.7 Colors

Colors referenced are based on the Pantone Matching System (PMS) printing inks because similar standards do not exist for porcelain enamel. (Exception: The color of back panel, Weathering Steel Brown, is specified as an actual porcelain frit. Colors references are:

- Warm Grey No. 2 PMS WG2
- Dark Green PMS-5605
- Grey Brown PMS-405
- NPS Brown PMS-1615C
- Dark Blue PMS-303C
- Olive Green PMS-5753C
- Black PMS-Black-7C
- Gold PMS-131C
- Light Brown PMS-154C
- Safety Yellow PMS-130C
- Safety Red PMS-485C
- White PMS-White
- Bright Blue PMS-301
- Bright Green PMS-341
- Bright Red PMS-187

19

Computer Cut Adhesive Graphic Signs

19.0 Introduction

Adhesive, computer cut graphics adhered to aluminum with retroreflective background and retroreflective and nonreflective graphics for small guide signs, miscellaneous postings, and applicable small panels.

19.1 General Requirements

Adhesive vinyl graphics to be computer cut from vector art files are created in a vector based program: Adobe Illustrator (or compatible programs such as Corel Draw, or Macromedia Freehand). Contractor shall produce computer cut graphic sign panels from the electronic art files as supplied. Finished artwork must match original precisely on basic measurements of typeface replication including: stroke width, letter space, and symbol and arrow size and proportion. Letter stroke to be a continuous line with no ragged edges or ragged interior corners.

19.2 Art Preparation

All artwork for panels will be provided as electronic files in Adobe Illustrator, EPS or other vector based programs such as Corel Draw or Macromedia Freehand, with all type and illustrations in-position following the established typographic specifications and grid formats.

19.3 Graphic Material

- Type I-A medium-intensity retroreflective sheeting referred to as “engineering grade” with Class 1 adhesive backing that is pressure sensitive per ASTM 4956-01 and FHWA standard specification FP-96
- Type II-A medium high-intensity retroreflective sheeting referred to as “super engineering grade” with class I adhesive backing that is pressure sensitive per ASTM D4956-01 and FHWA standard specification FP-96
- Type III-A high-intensity retroreflective sheeting, referred to as prismatic retroreflective material with Class 1 adhesive backing that is pressure sensitive, per ASTM 4956-01 and FHWA -FP-917.0
- Transparent overlay film shall be warrantied by the reflective sheeting manufacturer for the life of the retroreflective sheeting
- Adhesive vinyl film shall be a 2 mil cast PVC film. Warrantee will be based on manufacturer and color. Manufactures include; Avery Dennison (XL-1000 nonreflective opaque films), and 3M (7700 series, 180 series, and 3600 series)

Products manufactured by 3M

Materials:	Retroreflective					Opaque
Colors:	Type I	Type II	Transparent	Type III	Transparent	Cast Adhesive
	Engineer Gr	S. Engineer Gr	Overlay film	Prismatic	Overlay film	Vinyl Films
White	3M-3290	na	na	na	na	3M-7725-10
Brown	3M-3279	na	na	na	3M-1179	3M-7725-19
Red	3M-3272	na	na	na	3M-1172	3M-7725-53
Green	3M-3277	na	na	na	3M-1177	3M-7725-186
Blue	3M-3275	na	na	na	3M-1175	3M-7725-17
Black	3M-580-85	na	na	na	3M-1178	3M-7725-12
Gold	3M-580-64	na	na	na	na	

Products manufactured by Avery Dennison

Materials:	Retroreflective					Opaque
Colors:	Type I	Type II	Transparent	Type III	Transparent	Cast Adhesive
	Engineer Gr.	S. Engineer Gr.	Overlay film	Prismatic	Overlay film	Vinyl Films
White	T-1500	T-2500	na	T-6500	na	XL-1001
Brown	T-1509	T-2509	XL 6009	T-6509	4809	XL-1036
Red	T-1508	T-2508	XL 6002	T-6508	4808	XL-1012
Green	T-1507	T-2507	XL 6007	T-6507	4807	XL-1032
Blue	T-1505	T-2505	XL 6005	T-6505	4805	XL-1018
Black	R-106	na	XL 6003	na	4803	XL-1003
Gold	R-103	na	NA	na	na	XL-1009

Nonreflective Adhesive Vinyl: Premium quality, cast, opaque pressure sensitive material designed for electro-cutting. Material shall be 2 mil thick with an outdoor life of 3-5 years.

Screen Printing Inks Products manufactured by 3M

Color: Black 3M-3985 (opaque)

Products manufactured by Avery Dennison

Color: Black Sericol TMII (opaque)

19.4 Compatibility of Graphic Sheeting

Background and legend shall use sheeting from the same manufacturer. Mixing of sheeting from different manufacturers is not be permitted and will void warranties.

19.5 Age of Material

The Contractor shall indelibly mark each carton of retroreflective materials showing the date received. No more than 12 months shall have elapsed from the date of purchase from the manufacturer to the date of application on the substrate.

19.6 Graphic Application**19.6.1 Quality**

Application of pressure-sensitive sheeting shall follow manufacturer's specifications.

19.6.2 Surface Preparation

Before application of the sheeting, the face shall be free of all foreign matter such as paint or dust. The aluminum shall be thoroughly cleaned and degreased with solvent and alkaline emulsion cleaner by immersion, spray, or vapor degreasing and dried prior to application of the sheeting coat.

19.6.3 Background Material

Panels shall be covered with one unspliced sheet. Background shall be adhered to front of sign panel prior to application of sign graphics. Background material to be applied as per manufacturer's specifications. Finished background application to be trimmed flush to the edge and be free of bubbles, edge lift, and or other surface imperfections.

19.6.4 Application of Adhesive Computer cut Graphics

All graphics for Small Guide, Area Entry, and Miscellaneous Posting signs will be retroreflective except for legends and symbols on Miscellaneous Postings and the Area Entry signs which are black nonreflective adhesive vinyl.

19.6.5 Graphics Application

Cut graphics to be applied using 3M—TPM5 ECF Transfer Tape to maintain alignment and relationship of all elements.

19.6.6 Legend Application

Legend shall be adhered to background after application of background sheeting to sign panel.

19.6.7 Application Alignment

Graphics placed on panels must align to specified grid format.

19.6.8 Horizontal Alignment

Using formats supplied, letters shall be horizontally aligned to a tolerance of (+/-) 0.125" from side of panel to left edge of legend with standard adjustments for round or overhanging letters. Inter-letter spacing shall be horizontally aligned to a tolerance of (+/-) 0.0625" from letter to letter and (+/-) 0.5" overall based on the typographic specifications in this document.

19.6.9 Vertical Alignment

Using formats supplied, letters shall be horizontally aligned to a tolerance of (+/-) 0.125" from top of panel to baseline of legend, or from baseline to baseline of multi-line legends. Optical adjustment for overhang of round letters will be maintained as set on the computer.

19.6.10 Sign Panel Size

The sizes of sign panel graphics are the same as the aluminum panels to which they are affixed, and the graphic is trimmed flush to the edge of the aluminum panel to which it is applied. These sizes are as specified below.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>90 cm wide</i>	<i>120 cm wide</i>
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel (double-high 60 nom.)	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157 cm

45 cm Panels for A.1, A.5, and J.1

<i>Width x Height (cm)</i>	<i>45 cm wide</i>
1 panel (45)	45 cm x 45 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (20)	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies

20 cm Panels for Fingerboard Signs: H.2

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (20)	80.1 cm x 20 cm

Reverse Angle Sign Assemblies

30 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (30)	30 cm x 30 cm	60.1 cm x 30 cm	75.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45)	45 cm x 45 cm	60.1 cm x 45 cm	75.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105cm wide</i>	<i>120cm wide</i>	<i>150cm wide</i>	
	105.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nominal)	60.1 cm x 62.157 cm	75.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 62.157cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies

15 cm Panels for Reverse Angle D.1, Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30)	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30cm	75.2 cm x 30 cm	90.3 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

20

Electrostatically Printed Digital Graphics Printed on Adhesive Vinyl

20.0 Introduction

This section covers electrostatically printed digital graphics printed on adhesive vinyl for use with UniGuide VIS Signs.

20.1 Product

This specification is based on a 3M Scotchprint™ finished graphic. Scotchprint™ is a matched component finished graphic produced by an authorized manufacturer using 3M Scotchcal™ or Controltac™ electrostatic films, UV resistant toners, durable over-laminates and a controlled production process that assures the durability and reliability of the finished graphic.

Full color, digital graphics shall be electrostatically printed on 4 mil 3M Controltac™ Electrostatic Marking Film 8640C (ES) adhesive vinyl film with 3M Scotchcal™ Protective Over-laminate 8945, and 3M Scotchcal™ Electrostatic Toners 8700/8800 (ES). The specified Scotchprint graphic is a durable, dimensionally stable (within 1/64" between -65 degrees F to +225 degrees F), four (4) year (2.5 year in southwestern U.S. environments) warranted product. When applied to a blank aluminum back panel, it can be easily replaced or updated on a seasonal basis.

20.2 Materials

Durable, matte vinyl, scuff resistant overlamine intended for production of full color, large format graphics which will withstand severe weather and surface abrasion. The graphic marking films shall be precoated with positionable, pressure sensitive adhesive which shall provide excellent adhesion to aluminum and porcelain enamel surfaces. The material, with comply feature, shall be capable of being applied with no air bubbles using basic application techniques. All components of the finished graphic (i.e., marking film, toners, over-laminates) shall be certified as compatible and supplied by one manufacturer as a warranted imaging system.

20.3 Graphic Reproduction

The recommended use of this material is for both single image and multiple copies of the same graphic. Material is selected for an intended display life of up to 4 years without noticeable degradation of graphics using electrostatic imaging direct from digital files. Imaging and graphic resolution: Scotchprint™ is produced directly from specified 3M graphics software and 3M printing hardware with 400 DPI (dots per inch) image fidelity.

20.4 Color Stability

Fading or color shift in the finished graphic shall not exceed visual acceptability. Toners shall have a light fastness rating of 7-8 on the DIN 16525 (Wool Scale) or equivalent industry standard and must be able to withstand 2750 without noticeable change in pigmentation. The 3M Scotchcal™ or Controltac™ Marking Film shall be compatible with the 3M Scotchcal™ Electrostatic toners.

20.5 Over-laminate

3M protective over-laminate 8945 (ES) shall be certified by the manufacturer as a matched component of the finished graphic and be supplied by the same manufacturer as the marking film and toner used to produce the graphic.

20.6 Sign Panel Size

The sizes of sign panel graphics are the same as the aluminum panels to which they are affixed. The graphic is trimmed flush to the edge of the aluminum panel to which it is applied. These sizes are as specified below. No edge sealing is required to maintain warranty requirements.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>90 cm wide</i>	<i>120 cm wide</i>
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel (<i>double-high 60 nom.</i>)	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157 cm

45 cm Panels for A.1, A.5, and J.1

<i>Width x Height (cm)</i>	<i>45 cm wide</i>
1 panel (<i>45</i>)	45 cm x 45 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (<i>20</i>)	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies

20 cm Panels for Fingerboard Signs: H.2

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (<i>20</i>)	80.1 cm x 20 cm

Reverse Angle Sign Assemblies

30 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (<i>30</i>)	30 cm x 30 cm	60.1 cm x 30 cm	75.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45)	45 cm x 45 cm	60.1 cm x 45 cm	75.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nominal)	60.1 cm x 62.157 cm	75.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 62.157cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies**15 cm Panels for Reverse Angle D.1, Vertical E.1**

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30)	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30cm	75.2 cm x 30 cm	90.3 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

20.7 Application to Aluminum Substrate

Aluminum panel to be thoroughly cleaned and free of any oils. Lightly sand surface with orbital sander with fine sandpaper to aid adhesion of adhesive graphics. Clean sanded surface to remove sanding residue.

Cut graphic to same size as backing panel (above). Align top of graphic with top of panel and tape across top to secure. Lift graphic and remove backing paper. Holding the two bottom corners, gently lay the adhesive graphic panel on the aluminum substrate. Squeegee the graphic to the aluminum in broad overlapping strokes beginning at the upper taped edge and proceeding to the bottom of the graphic. Follow manufacturer's directions for application, including minimum temperature of backing panel for proper adhesion.

21

High Resolution Ink Jet Printed Digital Graphics Printed on Adhesive Vinyl

21.0 Introduction

Full color digital graphics printed at high resolution (1200 DPI). The finished product is a highly durable, richly colored and dimensionally stable, 3 year warranted product.

Print on Hewlett Packard 5500 inkjet printer with finished graphic printed on .005 mil thick Rexa SA self-adhesive vinyl DMVLAS. Material printed with HP No. 83 Series exterior grade pigment based uv protectiveover-laminate. Once surface has cured, apply Epic brand 4TSM Super Lustre overlamine .004 mil thick. Apply overlamine with Coda 60" thermal pressure laminator. Pigment toner and over laminate have an exterior warranty of ten years.

21.1 Materials

Durable luster vinyl, abrasion resistant overlamine intended to enhance and protect full color, graphics to withstand severe weather and surface abrasion. The back of the graphic marking films are pre-coated with positionable, pressure sensitive adhesive which shall provide excellent adhesion to aluminum and porcelain enamel surfaces. When graphic is applied to a blank aluminum back panel, the adhesive vinyl can be removed and the panel reused or updated on a seasonal basis, for on-site replacement. The material, with 3M™ Comply feature, can be applied with no air bubbles using basic application techniques. All components of the finished graphic including, marking film, toners, overlamines, shall be certified as compatible and supplied by one manufacturer as a warranted imaging system.

21.2 Graphic Reproduction

Imaging and graphic resolution: Inkjet is produced directly from specified Hewlett Packard graphics software and Hewlett Packard printing hardware at 1200 DPI (dots per inch) image resolution. This is the highest resolution graphic imaging process in the UniGuide system. The recommended use of this material is for both single image and multiple copies of the same graphic. The material is selected for an intended display life of 3 to 10 years without noticeable degradation of graphics using inkjet imaging direct from digital files. This material is ideal for applications requiring order response of two days in response to quick-ship project requirements, those applications like fee signs, or signs with dates that may be changed annually, and where highest graphic resolution is desired in an affordable product.

21.3 Sign Panel Size

The sizes of sign panel graphics are the same as the aluminum panels to which they are affixed. The graphic is trimmed flush to the edge of the aluminum panel to which it is applied. These sizes are as specified on the following page. No edge sealing is required to maintain warranty requirements. An alternative approach is to wrap the left and right sides of the panel graphic to eliminate exposed edges and create a more finished graphic assembly.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>90 cm wide</i>	<i>120 cm wide</i>
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel <i>(double-high 60 nom.)</i>	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157 cm

45 cm Panels for A.1, A.5, and J.1

<i>Width x Height (cm)</i>	<i>45 cm wide</i>
1 panel <i>(45)</i>	45 cm x 45 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel <i>(20)</i>	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies

20 cm Panels for Fingerboard Signs: H.2

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel <i>(20)</i>	80.1 cm x 20 cm

Reverse Angle Sign Assemblies

30 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel <i>(30)</i>	30 cm x 30 cm	60.1 cm x 30 cm	75.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel <i>(45)</i>	45 cm x 45 cm	60.1 cm x 45 cm	75.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel <i>(60 nominal)</i>	60.1 cm x 62.157 cm	75.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 62.157cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies

15 cm Panels for Reverse Angle D.1, Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel <i>(30)</i>	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30cm	75.2 cm x 30 cm	90.3 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

21.4 Application to Aluminum Substrate

Aluminum panel to be thoroughly cleaned and free of any oils. Lightly sand surface with orbital sander with fine sandpaper to aid adhesion of adhesive graphics. Clean sanded surface to remove sanding residue.

Cut graphic to same size as backing panel. Align top of graphic with top of panel and tape across top to secure. Lift graphic and remove backing paper. Holding the two bottom corners, gently lay the adhesive graphic panel on the aluminum substrate. Squeegee the graphic to the aluminum in broad overlapping strokes beginning at the upper taped edge and proceeding to the bottom of the graphic. Follow manufacturer's directions for application, including minimum temperature of backing panel for proper adhesion.

22

Digitally Printed Graphics Incorporated in High Pressure Laminate Panels

22.0 Introduction

This specification is based on iZone brand product. iZone is a durable high-pressure laminate that consolidates high resolution, full color graphics in the laminate assembly. The following are specifications for iZone (iZone - Imaging by Wilsonart International, 2400 Wilson Place, Temple, Texas 76503) brand, (or equal) outdoor grade high-pressure laminate sign material.

22.1 Outdoor Grade

iZone™XT - High pressure laminate graphic sign material is composed of several layers of phenolic (opaque) resin impregnated kraft filler paper collated to a thickness from 0.093” and, surfaced by a layer of coated inkjet graphic image substrate, digitally imaged with UV resistant, pigment based process color inks, two UV resistant melamine (clear) overlay sheets, with a modified acrylic overlay for further UV resistance and hardness, which has been pre-consolidated with an industrial optical coating. The optical top-coating assures UV resistance of over 97% of all harmful UV rays and further tempers the surface to resist vandalism and provides a surface that accommodates easy cleaning of graffiti without degrading the graphic surface. Layers of material are to be assembled and heat/pressure consolidated in laminate presses at approximately 1300 PSF at temperatures exceeding 295 degrees Fahrenheit. Once cooled, the paper must be completely absorbed by the melamine to assure a solid thermoset plastic.

22.2 Surface

The surface shall be: a satin-matte that resists marks, and diffracts sunlight.

23

Digitally Printed Graphics Embedded in Fiberglass Panels

23.0 Introduction

This specification is based on engineered fiberglass signs and digitally printed graphic panels manufactured by Pannier Graphics in rigid form known as Modulite® (or approved equal) which combines exceptional strength and durability with full color, high resolution graphics capability. The materials specified below are based on overall requirements of the project including durability and life-cycle cost.

23.1 Application

Embedment fiberglass is ideal for multiple panel editions, ink-jet print technology is a viable alternative for low quantity editions.

23.2 Material

Sign must be manufactured of non-yellowing, R-70 clear resin (or UV stabilized, acrylic-modified polyester resin) reinforced with high solubility, chopped strand fiberglass mat so that the index of refraction ensures clarity of all color, copy, and graphics. Glass fibers should not be readily discernible on the sign face. In addition, sign must have a glass content of no less than 28% of the total sign weight.

23.3 Fabrication

All copy and graphics must be permanently embedded in the fiberglass panel. The resulting sign must be a solid, one-piece panel with all graphics inseparable from the fiberglass in which they are embedded. Artwork must become a permanent part of the fiberglass sign so it will not delaminate. Laminated or encapsulated products are unacceptable.

23.4 Material Performance Requirements

Sign must have an ambient temperature range of -65 degrees F to +350 degrees F. Sign must have a minimum Barcol hardness of 50, tensile strength of 12,000 psi, compressive strength of 20,000 psi, and flexural strength of 18,000 psi. Minimum impact strength of sign must be 6 ft. lbs./in. notch with a fire resistance of 500°F. Sign face must not be permanently defaced by steam, mild acids, aromatics, scratching, inks, or paints and should be readily wiped clean with paint remover and solvents without affecting the appearance or legibility of the sign finish or graphics.

Sign face should retain legibility and finished appearance when sprayed with a 10% solution of hydrochloric, nitric, or sulfuric acid for one-half hour or when scrubbed by a brush of medium hardness using common commercial cleaning compounds such as ammonia, laundry soaps, detergents, carbon tetrachloride, or petroleum based solvents.

Sign must be opaque or translucent with a clear or matte finish, as indicated, with a minimum embedment of all graphic elements of 0.03125 inches (1/32").

23.5 Thickness

Panels to be 0.093" thick.

23.6 Surface Finish

Panel to have matte finish

23.7 Graphic Resolution

Full color, digital graphics, printed by 600 dpi ink-jet or high resolution screen printing. Screen printed graphics to be made using 85 (lpi) lines per inch, and to be free of any modeling or varying density of line and color.

23.8 Color Stability

Digitally imaged graphics to retain color values for up to five (5) years without fading.

23.9 Panel Sizes

Embedded fiberglass signs to be cut to the following sizes. Size variation from these sizes shall not vary more than (+/-) 1/10,000.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>90 cm wide</i>	<i>120 cm wide</i>
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel (<i>double-high 60 nom.</i>)	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157 cm

45 cm Panels for A.1, A.5, and J.1

<i>Width x Height (cm)</i>	<i>45 cm wide</i>
1 panel (<i>45</i>)	45 cm x 45 cm

Vertical Sign Assemblies

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (<i>20</i>)	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies**20 cm Panels for Fingerboard Signs: H.2**

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (20)	80.1 cm x 20 cm

Reverse Angle Sign Assemblies**30 cm Panels for C.1-5**

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (30)	30 cm x 30 cm	60.1 cm x 30 cm	75.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45)	45 cm x 45 cm	60.1 cm x 45 cm	75.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105cm wide</i>	<i>120cm wide</i>	<i>150cm wide</i>	
	105.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nom.)	60.1 cm x 62.157 cm	75.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 62.157cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies**15 cm Panels for Reverse Angle D.1, Vertical E.1**

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30)	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30cm	75.2 cm x 30 cm	90.2 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

23.10 Cutting and Finishing

Signs must be router cut (no saws), the sign edges must not be crazed or cracked, and the edge finish must be smooth, clean, and neat. Embedded fiberglass panels are to be cut to within 1 mm of specified size. Panels to be flat, clean, and free of any surface imperfections. All edges are to be square and without edge burrs or deflection from cutting.

23.11 Maintenance

Clean with any solvent based cleaner and polish with auto or boat wax.

23.12 Warranty

Screen-printed signs must be warranted for a period of 10 years against chipping, delaminating, and fading.

24

Imaging and Artwork

24.0 Introduction

This section covers all imaging and art work used in the UniGuide Visitor Information System.

24.1 Low Volume

Imaging is to be executed on a coated inkjet, melamine compatible base paper, which is printed on piezo-based ink-jet imaging equipment as manufactured by Encad, Xerox Colorgraphix, or equal.

Digital imaging will be of even consistency throughout the image. Resolution, while dependent upon final imaging output size, should attain a maximum of 600 dpi at final output sizes under 24 x 36 inches. This will decrease as the final output size increases, but the manufacturer must insure the at maximum resolution is attained given the parameters of the imaging hardware.

24.2 High Volume

High-resolution digital print imaging must be used for imaging applications that require high volume runs of a single panel while affording very good fidelity for typography and fine line images.

24.3 Imaging Inks

Inks used in the printing process shall be UV resistant and opaque. The ink shall be pigment based to insure maximum durability.

24.4 Sign Panel Size

The size of high pressure laminate sign panels are as specified below. High pressure laminate panels are to be cut to within 10/1000 of specified size. Panels are to be flat, clean, and free of any surface imperfections. All edges are to be square and without edge burrs or deflection from cutting.

Vertical Sign Assemblies

30 cm Panels for A.1, A.5, J.1, and vertical section only for B.1, & B.2

Width x Height (cm)	30 cm wide	60 cm wide	90 cm wide	120 cm wide
1 panel	30 cm x 30 cm	60.1 cm x 30 cm	90.2 cm x 30 cm	120.3 cm x 30 cm
1 panel (double-high 60 nom.)	30 cm x 62.157 cm	60.1 cm x 62.157 cm	90.2 cm x 62.157 cm	120.3 cm x 62.157 cm

45 cm Panels for A.1, A.5, and J.1

Width x Height (cm)	45 cm wide
1 panel (45)	45 cm x 45 cm

20 cm Panels for Small Area Entry Signs & Small Road Guide Signs: A.1, A.5

<i>Width x Height (cm)</i>	<i>60 cm wide</i>	<i>80 cm wide</i>
1 panel (20)	60.1 cm x 20 cm	80 cm x 20 cm

Flag-Mounted Sign Assemblies**20 cm Panels for Fingerboard Signs: H.2**

<i>Width x Height (cm)</i>	<i>80 cm wide (with double 125 degree miter on leading edge)</i>
1 panel (20)	80.1 cm x 20 cm

Reverse Angle Sign Assemblies**30 cm Panels for C.1-5**

<i>Width x Height (cm)</i>	<i>30 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (30)	30 cm x 30 cm	60.1 cm x 30 cm	75.2 cm x 30 cm	90.2 cm x 30 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 30 cm	120.3 cm x 30 cm	150.4 cm x 30 cm	

45 cm Panels for C.1-5

<i>Width x Height (cm)</i>	<i>45 cm wide</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (45)	45 cm x 45 cm	60.1 cm x 45 cm	75.2 cm x 45 cm	90.2 cm x 45 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>	
	105.3 cm x 45 cm	120.3 cm x 45 cm	150.4 cm x 45 cm	

60 cm Panels for C.1-5

<i>Width x Height</i>	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
1 panel (60 nominal)	60.1 cm x 62.157 cm	75.2 cm x 62.157 cm	90.2 cm x 62.157 cm
	<i>105 cm wide</i>	<i>120 cm wide</i>	<i>150 cm wide</i>
	105.3 cm x 62.157cm	120.3 cm x 62.157 cm	150.4 cm x 62.157 cm

Narrow Profile Sign Assemblies**15 cm Panels for Reverse Angle D.1, Vertical E.1**

<i>Width x Height (cm)</i>	<i>15 cm wide</i>	<i>30 cm wide</i>	<i>45 cm wide</i>
1 panel (30)	15 cm x 30 cm	30 cm x 30 cm	45 cm x 30 cm
	<i>60 cm wide</i>	<i>75 cm wide</i>	<i>90 cm wide</i>
	60.1 cm x 30cm	75.2 cm x 30 cm	90.2 cm x 30 cm

15 cm Panels for Campsite Identification Number Sign Assembly: Vertical E.1

<i>Width x Height (cm)</i>	<i>15 cm wide</i>
1 panel/Half high	15 cm x 14 cm

24.5 Cutting

All fabrication tools used in shaping and cutting of high pressure laminates must be sharp as new and carbide-tipped. Saw blades must be no less than 10" diameter, hollow ground, 60 - 80 tooth, carbide tipped, running at a minimum of 4500 rpm to insure smooth edges with no chipping or sharp protrusions.